JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA

FOR THE

PROMOTION OF THE MECHANIC ARTS.

JUNE, 1856.

CIVIL ENGINEERING.

*Description of a New Expansive Valve-Motion for Steam Engines.**

By Mr. GEORGE M. MILLER, of Dublin.

The object of the valve-motion described in the present paper (the invention of Mr. John Wakefield, of the Great Southern and Western Railway, Dublin,) is to obtain an expansive action more simple and more perfect than the motion usually employed, the whole motion being obtained from a single eccentric upon the crank-shaft.

The general arrangement of the valve-motion consists of an eccentric, which, instead of being keyed upon the axle in the ordinary manner, is mounted upon a transverse slide, which is capable of being moved at right angles to the axle by means of a handle that takes the place of the ordinary reversing handle or lever. The effect of moving the transverse slide is to alter the throw of the eccentric, or to reverse its position,—thereby enabling the valve of the one engine or cylinder to which it belongs to be worked expansively or reversed. The valve of the second engine or cylinder (in the case of the usual pair, with cranks at right angles to each other,) is worked by a second rod, connected with the same eccentric by means of an arm projecting at right angles to the direction of the first eccentric rod, so as to give to both valves a similar motion, but corresponding to the relative position of the two cranks at right angles to each other.

Upon the crank-axle, and close up against one of the cranks, is fitted a concentric collar, fixed to the axle either by keys, or by screws tapped into the crank-cheek, through lugs cast on the collar on the side next

* From Newton's Lond. Journ., March, 1856.

the crank. On the other side of the collar are cast two parallel beveled slides, situated transversely and equidistant from the centre of the axle. Upon these is fitted a corresponding sliding-frame, carrying a circular ring cast upon it, projecting from its face, which is situated not equidistant between the two parallel slides, but is set eccentrically—that is, nearer to one slide than to the other, by the amount of the minimum throw of the eccentric. The circular ring on the sliding-frame, thus takes the place of the ordinary eccentric, and is fitted with the eccentric strap, on the front edge of which is forged the end of the rod, by means of which the spindle of one of the valves is worked. On the back edge of the eccentric strap, and in the same straight line with the eccentric rod, is forged a slotted arm, having a horizontal slot fitted with a slide block; in which is inserted a pin, projecting from the arm of a loose ring, concentric with the axle, and working in a groove in the fixed collar, which is keyed thereto. This loose ring is furnished with a second arm, at right angles to the arm first mentioned, and also with a balance-weight. To the second arm is attached a rod, similar to the eccentric rod, by which the spindle of the second valve is worked.

The reversing action is effected by means of a crank-lever, which is connected by a strap to a collar that is free to slide along the axle, but revolves with it. This collar carries two racks, which drive the two pinions set at opposite sides of the axle. The pinions are screwed internally to fit on two large four-threaded screws, which are secured in the sliding-frame previously described; and being placed in cavities in the fixed collar, they are incapable of any lateral motion. In reversing the engine, the crank-lever is rocked, and the collar with its racks slidden along the axle. This causes the pinions to rotate, and the screws on which they work being held fast in the sliding-frame, a transverse motion is communicated to the frame, which, with the eccentric ring attached to it, is carried along the parallel slides,—thus reversing the position of the eccentricity.

It has to be observed, that with this motion the engine can never be thrown entirely out of gear. When the engine is reversed, the centre of the eccentric describes a chord line, not the diameter of the circle of eccentricity,—and, consequently, the minimum to which the throw can be reduced, is the distance of this chord line from the centre of the axle, or the sum of the lead and lap of the slide; but the same circumstance applies to the ordinary link motion, and although, for this reason, the expansive action of the steam cannot be extended indefinitely, yet practically this is no objection to the valve-motion; since between the positions of maximum and minimum throw, it admits of as great a range for the application of the expansive principle as can be made practically available where the link motion is employed.

In the new valve-motion the lead is constant for all positions of gear; whilst in the ordinary or shifting link-motion it varies to a certain extent with every change of position, increasing as the throw of the valve diminishes; in the new valve-motion, accordingly, the expansive action alone is altered by regulating the amount of throw, whilst the lead is not affected by the change.

A practical trial of this valve-motion has been made in two locomotive

engines on the Great Southern and Western Railway, which have been working with it 1½ and 1¼ years respectively, since March and July, 1854. One of these, a passenger engine, is fitted with the new motion as shown in the drawings and model exhibited to the meeting. In the other, a goods engine, a slight modification has been made, the construction being simplified by dispensing with the slotted arm, projecting from the back edge of the eccentric strap, and substituting a similar slot in the eccentric rod; the arm of the loose concentric ring is thus brought round to the front, and the balance-weight is placed behind.

The passenger engine, No. 9, has 15-inch cylinders with a 20-inch stroke, and 5 feet 6 in. driving wheels: it has been working regularly between Dublin and Thurles (a distance of 87 miles), with two other engines, Nos. 17 and 19, by the same maker, and similar in all respects except that they are furnished with the ordinary link-motion.

The results of the working of these three engines during the 1½ year, from the 18th March, 1854, to 12th October, 1855, are as follows:—

	Miles run.	Coke per mile. lbs.	Average load. Carriages.
No. 9,	44,450	20·3	6·0
No. 17,	42,741	23·6	5·9
No. 19,	27,194	24·9	5·8
Mean with link-motion,		24·25	5·85
Mean with new valve-motion,		20·03	6·00

The carriages are six-wheeled, and weigh seven tons empty.

A comparison of the results of the performance of these engines for the periods before stated, shows an average saving in consumption of coke of 4¼ lbs. per mile, or 17½ per cent. in favor of the engine having the new valve-motion.

The goods engine, No. 53, has worked well, but the variable character of the work assigned to the goods engines on the above line renders it difficult to compare their performance.

The No. 9 passenger engine has now had it more than 1½ year in constant work. The motion has undergone no repair during the whole time, except that a thin lining of white metal has been recently put upon the face of the beveled slides, which had worn a little slack, having been in the first instance made of brass.

The No. 53 goods engine has been more than 1¼ year in constant work with the new valve-motion, and has run during that time 23,581 miles. The motion has had no repairs, and has never even been taken to pieces and examined since first got to work until a fortnight ago; and when the parts were then detached for inspection, they were found in excellent condition, the working faces all in good order, the teeth of the racks and pinions showing no signs of wear, and the whole play of the apparatus amounting to only about $\frac{1}{16}$th of an inch, being little more than it had when originally set to work.

It may be thought that the application of this new motion encumbers the crank axle with more complex machinery than is the case when four eccentrics are used; but it must, on the other hand, be observed, that the remainder of the space under the boiler is left more free for examination and cleaning; also, the eccentric rods have at all times only the same

extent of motion as the valves, whilst with the link-motion most of the working parts reciprocate over the same space, whether the engine be working expansively or not.

Notice of the Successful Application of Wood-Bearings to Shaflings, &c., in H. M's. Screw Steamer Himalaya.

Southampton, March 17, 1856.

H. M.'s screw steamer *Himalaya* has been docked here during the last week, and we are much pleased to observe that the lignum vitæ bearings applied to her screw shaft, by Messrs. Penn, have worked remarkably well. Since the application of this material the vessel has run about 30,000 miles, during which time the engines have made about 8,000,000 revolutions. The total wear down in the stern-post does not exceed $\frac{1}{8}$-inch. which is, of course, very trifling for the work done. The screw shaft is lined with brass at the part bearing on the wood, and this bearing is 18 inches diameter $\times$ 4 ft. long. The lignum vitæ is inserted into the cast iron stern pipe in segments, each piece being the whole length of bearing, and about 3 inches wide $\times \frac{3}{4}$-inch thick, so that the segments combine into the form of the pipe, in a somewhat similar way as the staves of a cask. The abutting edges of these segments are rounded off to form water-ways, and their surfaces are also scored in several places to allow a free circulation of water on every part of them. These segments are prevented from running round with the shaft through its friction by a strip of metal, which is pinned on to the upper side of the stern pipe, and against the edges of which the lignum vitæ segments abut. They are kept in at the inner end by a shoulder in the stern pipe, and at the outer end by a ring, which is screwed on to the stern post.

We are indebted to the courtesy of Mr. Gray, the engineer of the *Himalaya*, for a description of a very ingenious application of lignum vitæ which he has adopted in his collar or thrust bearing. He found this bearing wore considerably, and when in the Mediterranean last year, the brass rings had thus become so reduced that there was a space of about $\frac{3}{4}$-inch on the slack side of the collars. He determined to try the experiment of interposing lignum vitæ segments between the thrusting collars on the shaft and the brass rings on the bearing, and fitted them in four segments of a circle to each collar, so that they can be slipped in their place without removing the bottom brass. They are prevented from running round with the shaft by a brass plate screwed on to the lower brass, and are so easily removed and refitted that two hours only are necessary for applying new segments to the block.

Mr. Gray finds that a set of lignum vitæ segments, thus applied, will last for from 7000 to 10,000 miles, and the expense of fresh wood segments is very trifling.

We think that this plan is a very happy illustration of the old adage of "Necessity being the Mother of Invention," and doubt not that many of our sea-going readers will thank Mr. Gray for his novel application of materials.

* From the London Artizan, April, 1856.

Mr. Gray informs us that when the *Himalaya* has a clean bottom, and is in ordinary weather and without sails, she runs 1 mile with 250 revolutions of engines; but when her bottom becomes foul, from seven or eight months' running, it requires 300 revolutions of engines per mile run. This gives a slip of screw amounting to about 13 per cent. in one case and 27½ per cent. in the other, and shows what a dirty bottom will do in stopping the progress of an iron ship, and the great desideratum for some material which will arrest this fouling.

---

*On the Relative Proportions of the top, bottom, and middle webs of Iron Girders and Tubes.** By Mr. Hepple, M. Inst. C. E.

The object of the paper was the investigation of the forces to be resisted by the middle webs of girders.

The first part of the inquiry had reference to the case of a plate of metal subjected to the action of various direct forces,—some compressile and others tensile,—simultaneously applied to it, in different directions; and it was shown that these might always be resolved into two principal resultants, which were invariably at right angles to each other; and by which the applied forces, however numerous, might be conceived to be replaced—the condition of the plate being absolutely the same, whether considered as subject to the forces originally applied, or to their two principal resultants.

The next point was the consideration of the condition of a rectangular plate, held in equilibrium by lateral forces, applied in couples, uniformly distributed along its sides; and it was shown, that in this case also, there were two principal resultants,—one tensile and the other compressile,—that these two were of equal intensity, at right angles to each other, and at angles of 45° with the applied forces: moreover, that their intensity was exactly equal to that of the applied lateral forces.

It was next shown, that the middle web of a girder exposed to a load, at a given point, was exactly in the condition of the plate last considered, and a rule for the computation of its thickness was arrived at.

Other cases of the distribution of loads, both fixed and movable, were then considered, and rules for the corresponding thickness deduced.

The effect of the horizontal strains to which the middle web was subject, was then considered, and an investigation was made of the magnitude and direction of the resultants arising from their composition with the diagonal forces before considered.

Finally, the increase to be made in the thickness of the middle web, beyond that already arrived at, in order to enable it to deal with these horizontal and diagonal strains together, was investigated, and a rule was deduced for its definite determination.

The results arrived at were briefly these:—Four different cases of distribution of the load being considered, and, in the first instance, the hori-

* Read before the Institution of Civil Engineers; London, Jan. 15th, 1856.

zontal forces being left out of consideration, and the thicknesses determined with reference to the diagonal forces only. These four cases were,—

1. That in which the load was fixed and central.
2. That in which a load concentrated on a point, moved along from one end of the beam to the other, as the case of a concentrated roller load.
3. That in which the load was fixed and uniformly distributed.
4. That in which a load, uniformly distributed, was drawn on from one end, or that of a distributed roller load.

It was then shown, that in order to enable the middle web to deal with the diagonal strains, its thickness should be determined by the following methods :—

In the first case,—the fixed central load,—by making it of uniform thickness, and such that its horizontal section was equal in area to the central vertical sections.

In the other three cases the thickness of the middle web, at the extremities, was twice that determined as above. In all of them it diminished towards the centre, but in each case according to a different law.

In the second case,—the concentrated rolling load,—the thickness varied as the distance from the more remote extremity.

In the third case,—the distributed fixed load,—the thickness varied as the distance from the centre.

In the fourth case,—the distributed rolling load,—the thickness varied as the square of the distance from the more remote extremities.

The cases of combinations of these kinds of loads were then considered, and it was shown, that by dividing the central vertical section into portions proportional to the amount of each kind, and thence determining the thicknesses from the middle web for each kind, according to its own law—the sums of the thicknesses, so determined, would give those necessary for dealing with the compound load.

The effect of the horizontal forces was next considered, and two cases were taken : first,—that in which the section of the beam diminished from the centre towards the extremities, in the ratio of the rectangle of the segments of the length,—in which case the horizontal forces were constant, or nearly so, throughout.

In this case it was shown, that the thicknesses, as before determined with reference to the diagonel forces alone, should be trebled, in order to fit them to resist the resultants arising from their composition with the horizontal forces; and, as in all beams, where any variation whatever was made in the vertical section, it did, or should approximate to the above law. It was considered, that this rule should be taken as applicable to beams of variable section.

For beams of uniform section, it was shown, that the thickness of the middle web should be such, that the horizontal section should be three times the vertical area.

The stiffening of the sides was then considered. It was argued, that as the efficiency of the stiffening must, in some way, depend on the amount of area, compared with the amount of support applied to it, it might reasonably be supposed to be proportionate to a line which would form a web to the rectified periphery,—a rectangle equal to the area to be

supported,—which line (borrowing a phrase from hydraulics), might be called "its mean radius." Reasons were then adduced, for believing that stiffening pieces might, with safety, be so distributed, as to leave the mean radius of the included spaces equal to seventy times the thickness of the plate; although, in most early structures, it would be found to be much less than what would result from such a calculation.

---

*Canal through the Isthmus of Suez.**

It will be gratifying to all who have taken an interest in the practicability of opening up a ship canal between the Mediterranean and the Red Sea, to learn from the Report of Investigation, by the engineers who have recently been engaged on the survey, that no engineering difficulty presents itself to the carrying out of the project between Suez and Pelusium. It will be remembered that this is the line proposed by Mr. Lesseps—the particulars of which he detailed, in a work extensively circulated—about nine months since. The capital required will be about six millions; and if the money market continues to improve, the undertaking will be brought in an organized form before the public.

"For the moment we give," say the Commission, "the following conclusions:

"1. The line on Alexandria is not admissible in a technical and economical point of view.

"2. The direct line offers every facility for the execution of the maritime canal, properly so called, with a branch to the Nile, and the usual difficulties for the creation of the two ports.

"3. That of Suez will open upon a large and sure roadstead, accessible at all times, with eight metres of water at 1600 metres from the shore.

"4. That to be formed in the Gulf of Pelusium, which the first plan placed at the end of the Gulf, wil lbe placed 18 kilometres more to the west, where there are eight metres of water at 2300 metres from the shore, with good anchorage.

"5. The expense of the canal of the two seas, and of the works connected with it, will not exceed the sum of 200,000,000 francs, as put down to the estimates of the engineers of the viceroy.

"The members of the International Commission for cutting a canal through the Isthmus of Suez—

"F. Conrad, *President*, A. Renaud,
"Negreli, J. M'Lean,
Lieusson, *Secretary*."

From the Lond. Mech. Mag., Jan., 1856.

AMERICAN PATENTS.

List of American Patents which issued from April 1st, to April 22d, 1856, (inclusive,) with Exemplifications.

APRIL 1.

1. For *Improved Self-inking Stamps;* Nathan Ames, Saugus, Mass.

Claim.—"In combination with the frame and shaft, the arrangement of devices by which the type or printing surface is inked, and the impression produced by one downward motion of the hand, or other power, applied to the perpendicular shaft—the inking roller (being acted upon by two forces, the perpendicular and diagonal,) moving first over the bottom of the type block, and then over the back side of the same."

2. For an *Improved Lubricator;* Edward J. Baker, Baltimore, Maryland.

Claim.—"The combination of the reservoir with the vertical stem or spindle, by means of the conical sockets and bearings in the upper and lower parts of the reservoir, together with the passages or openings, which are in said sockets and bearings, for the admission and discharge of the oil or lubricating fluid, and also for the escape of the air from the reservoir while oil or fluid is being poured into it—the said passages being alternately opened and closed, by rotating or moving the reservoir around, or partly around the central stem or spindle."

3. For an *Improved Bench Vise;* Benjamin G. Ball, Nashua, New Hampshire.

Claim.—"Combining the rotary shaft and the shanks of the jaws, the tubular screw connexion and the clutch, when a rotary shaft is made to actuate the jaws."

4. For an *Improvement in Making Seamless Metal Tubes;* William F. Brooks, City of New York.

Claim.—"The grooving or removing the carriers of the rollers, so that a series of parallel projections or ribs, will be formed upon the tube; the rollers relieved from understrain, protected from choking, and the reduction of the tube and the withdrawal of the mandrel therefrom facilitated."

5. For an *Improvement in Rolling Railway Bars;* John W. Brown, Mt. Savage Iron Works, Maryland.

Claim.—"So forming one or more of the grooves of the rollers, as to produce a depression or cavity, all along that side of the bar which is to form the base of the rail, previously to the reduction of the bar to form the neck; said cavity to be filled up by the displacement of the iron from the middle of the rail, by the subsequent rolling operation."

6. For an *Improved Apparatus for Removing Grain from Harvesters;* Samuel Comfort, Jr., Morrisville, Pennsylvania.

Claim.—"1st, The employment in harvesters of the grated platform and radial grating, the same being constructed and operated in conjunction with each other. 2d, The radial grating with its two rollers, shaft, and arm, as connected to the shaft, in combination with the curved plate and its curved recess, for the purpose of turning over the said radial grating, and clearing it of the grain or grass. 3d, The arm with its projection recess, jointed inclined plane, in combination with the shaft, its cranked portions, and roller, for the purpose of giving the grated platform the desired vertical movement."

7. For an *Improvement in Breech Loading Fire Arms;* Hezekiah Conant, Hartford, Connecticut.

Claim.—"The inserting a metal ring into the slide with the chamber in rear of said ring."

8. For an *Improvement in Steam Boilers;* F. P. Dimpfel, Philadelphia, Penn.

Claim.—"The arrangement of the tubes and the connexion of a receptacle for consuming the fine particles of coal, which are carried by the force of the blast or draft, from the fire chamber into the flues, the said receptacle being placed below the bottom of the main flue, and communicating therewith and between the fire chamber, and a check or deflector in the main flue, to check the momentum of the particles of coal, and cause them

to drop into the receptacle to be consumed. Also, the combination of the boiler forming a single flue in the middle, for the passage of the products of combustion from the main flue surrounding the water tubes to the smoke box, by securing the rear ends of the water tubes to two tube sheets—one-half to each of said tube sheets, and leaving a space between the two tube sheets for the passage of the said middle flue, when this is connected with a check or deflector, placed in the main flue among the water tubes and in front of the said middle flue, to prevent the products of combustion from taking a direct course to the said middle flue. Also, arranging the bent up ends of the water tubes, when they are connected with the crown sheet of the furnace, in a series of double longitudinal rows, and leaving spaces between the double rows of greater width than the external diameter of the water tubes, to admit of taking out and inserting the tube, whilst, in other respects, the said tubes may be placed as near to each other as may be desired."

9. For an *Improvement in Grain Harvesters;* Augustus Elliot, San Francisco, Cal.

Claim.—"1st, Forming the cut grain into sheaves or bundles, by means of a series of endless bands and rollers, having an intermittent motion. 2d, The spring apron."

10. For an *Improved Hydrant;* Henry English, Baltimore, Maryland.

Claim.—"The combination of the square shanked valve and its seat, with the cap piece."

11. For an *Improved Printing Press;* George F. Folsom, Roxbury, Mass.

Claim.—"1st, The method of giving the impression with the two plates, by means of the gear and double cranks. 2d, The method of feeding two sheets into the nippers, by means of the binder, in combination with an intermittent feed."

12. For an *Improvement in Cloths for Felting Hat Bodies and other articles;* William Fuzzard, Charlestown, Mass.

Claim.—"The employment or use of a corrugated apron, constructed of any proper material."

13. For an *Improvement in Journal Box for Railroad Car Axles;* William B. Gage, Louisville, Kentucky.

Claim.—"In a railroad box, made with the cap box secured to the lower or main box or cell, which latter is formed to receive an inner box or cell, to contain cotton wash and oil, or other lubricator, is making in this combination, the inner box or cell with projecting lips, which embrace the lower half of the journal, to fit and slide in recesses in the sides of the brass or cap box, so that when the journal is inserted, and the inner box or cell is forced up against the journal by the springs, the whole circumference of the journal shall be embraced, to prevent the entrance of dirt and waste of oil, and yet permit the inner box or cell to approach the upper box as the surfaces wear—the fitting of the lips of the inner cell within the recesses of the cap box, permitting the two to approach and recede from each other without a break, for the escape of oil in the circle of the surfaces which embrace the journal."

14. For an *Improved Method of Manufacturing Augers;* George G. Griswold, Chester, Connecticut.

Claim.—"The form of the plate required for making the twist to the auger or bit."

15. For an *Improvement in Automatic Steam Whistles in Locomotives;* James Harrison, Jr., Milwaukie, Wisconsin.

Claim.—"The apparatus consisting of the spirally slotted or grooved cylinder, for connexion with and operation by the locomotive, detachable and adjustable lifters, of varying thickness, length or breadth, and lever, or its equivalent, in combination with, and for operation on the whistle."

16. For an *Improvement in Slide Rests;* Albert V. Hill, Hinsdale, New York.

Claim.—"The use of the slide mortise, driving screw, arranged and operating in connexion."

17. For an *Improved Mortising Machine;* Edward Joslin, Keene, New Hampshire.

Claim.—"Combining or arranging with the tri-armed sectional lever, and the post or frame of the tool carriage, two wooden springs and a connecting rod, so that one spring may be separated by draft, and the other by pressure, when said lever is placed downward."

18. For an *Improved Life Boat;* George W. La Baw, Jersey City, New Jersey.

Claim.—"Arranging the carriage or inner boat upon pivots, so as to allow the outer boat to rotate over and around the inside boat or carriage, which always retains an upright position."

19. For an *Improved Former for Spiral Springs;* Vincent D. Lent, Chelsea, Mass.

Claim.—"A former, constructed with suddenly expanded ends."

20. For an *Improvement in Spark Arresters;* Stimmel Lutz, Philadelphia, Penna.

Claim.—"The combination of the plates, branch pipe, and the cap or reservoir, provided with a central cavity, or its equivalent, in its upper end."

21. For an *Improved Method of Converting Reciprocating into Rotary Motion;* Robert Maffitt, Bradford, Pennsylvania.

Claim.—"The arrangement of the laterally projecting lifting teeth, on the semi-pinions, in combination with the guide grooves and lozenge projections."

22. For an *Improved Mitering Bench;* J. W. Mahan, Lexington, Illinois.

Claim.—"The peculiar construction of the mitre box, the advantages it possesses over, any other in use, being, 1st, so constructed, that it never wears out by the teeth of the saw cutting the box, as in the case in ordinary boxes; 2d, its easy combination with the other devices in my machine, for accomplishing the various results, which can be accomplished perfectly by any one, whether skilled or not, in the ordinary way of accomplishing said results, to wit: laying off and cutting picture frames, door and window frames, tenoning sash, &c. Also, its combination with the other device, as shown by my model drawings and specification."

23. For an *Improved Machine for Gathering Seeds or Grain in the Field;* Thomas E. Marable, Petersburgh, Virginia.

Claim.—"In combination with a gatherer for drawing in the heads, the rubbing boards having a vertical movement for receiving the heads under it, and then dropping down, and having a transverse rubbing motion, for rubbing out the seeds or grain."

24. For an *Improvement in Wrenches;* Philip McManus, Brunswick, New York.

Claim.—"The cam or eccentric, attached to the sleeve, and the rack attached to the sleeve by a spring, in combination with the rack on the shank. Also, in combination with the cam or eccentric and racks, the finger piece."

25. For *Improved Wind Wheels;* Francis Peabody, Salem, Massachusetts.

Claim.—"The method of hanging and arranging the two wheels, and adapting them to the opposite ends of a permanent building; the wheels with their regulating disks being secured to the revolving turn tables, at a distance from the point around which they revolve, equal or nearly so, to one-half the width of the building, whereby wheels of great diameter may be employed, in combination with a permanent building of any required dimensions. Also, the weights and pipe, with the chains, or their equivalents, in combination with the disks, for the purpose of regulating the motion of the wheel to the varying force of the winds."

26. For an *Improvement in Soldering Wire Ferrules;* Asahel Pierpont, New Haven, Connecticut.

Claim.—"The employment of the jaws, with the cone and foot, or their equivalents."

27. For an *Improved Instrument for Stirring Straw and Husk Beds;* Calvin A. Richardson, Waterville, Maine.

Claim.—"The mode of constructing said instrument for the purpose of stirring filling in beds."

28. For an *Improvement in Forge Fires;* William Rodgers and Abraham Bannon, Bellefonte, Pennsylvania.

Claim.—"The forge hearth, when employed in connexion with the tuyeres, operated by the lever."

29. For an *Improved Method of Varying the Stroke of Feeding Pump for Steam Engines;* John R. Lees, City of New York.

Claim.—"The use of an intermediate arm or lever, between the moving power that works a force or supply pump, attached to a steam boiler and the pump, with an adjustable sliding block, movable on said arm or lever."

30. For an *Improved Wheelwright Machine;* John Silton, Williamston, N. C.

Claim.—"1st, The double faced wheel working upon an axle, and made strong by flanches on the axle, upon which the blocks from which the felloes are cut, are secured by the clamps. 2d, The construction, operation, and use of the clamps. 3d, The construction, arrangement, and operation of the knives or cutters. 4th, The construction and operation of the grooved wheel. 5th, The felloe metre. 6th, The arrangement of a carriage or other wheel to the finishing wheel."

31. For an *Improved Lathe;* Henry C. Spaulding, City of New York.

Claim.—"1st, Attaching the cutter heads, by having the shanks of said cutters fitted in taper grooves which are made in the sides of the cutter heads, the inner ends of the grooves being wider than the outer ends, to permit the proper adjustment of the cutters. 2d, The shaft, when arranged so that it will rise and fall curvilinearly, and be at equal distances from the arbor or shaft, at any point of its movement, so that power may be applied to the gearing which operates the adjustable and reciprocating carriage from the stationary arbor or shaft, without changing the lengths of the driving belts. 3d, Holding or securing the sticks to be operated upon, by means of the jaws, operated by the grooved drum, lever, and plates. 4th, The hub arm with pawls attached, and operated for the purpose of rotating or turning the sticks the requisite distance between the centres, at each movement of the carriage, so that the sticks may be cut with any desired number of sides. 5th, Arranging the belt shipper with a hooked lever and pendant lever, and spring, and having a projecting pin attached to the side of the hub, so that the driving belt of the machine will be thrown off the driving pulley, at each entire revolution of the hub, so that the finished work may be removed from the machine, and fresh sticks placed between the centres."

32. For an *Improvement in Axle Boxes for Carriages;* Ezra M. Stratton, City of N. York.

Claim.—"Plain longitudinal channels across the enlarged portion of mail axle boxes, adapted to, and in combination with long bolts, for fastening carriage wheels upon mail axles, by which combination, the long bolts are brought close to the small portion of the box, and the whole so compactly grouped together, as to adapt mail axles and boxes, and long bolts to small hubs, such as are now required for light and fashionable carriages. Also, the combination of plain, longitudinal channels, made across the enlarged portion of mail axle boxes, with reverse channels made in corresponding portions of the hub, when the bars and hub are fitted for, and combined with the long bolts acting therein as keys between the box and hub, for the purpose of securely fastening the box in the hub, by means of the long bolts, which thus perform the functions of keys and dispense with the necessity for injuring the hub, by splitting and wedging the same, as has heretofore been necessary in all cases for fastening axle boxes in carriage hubs, whereby I preserve the whole strength of the hub, and materially cheapen the cost and labor of fitting and fastening the box therein."

33. For an *Improvement in Valve Gear of Oscillating Engines;* William Stephens, Pittston, Pennsylvania.

Claim.—"The arrangement of the slotted plate in the slide, or its equivalent, for the purpose of adjusting and varying the lead of the valve."

34. For an *Improved Field Fence;* S. G. Turfts, Wainesville, Ohio.

Claim.—"Constructing fences in distinct and separate sections, connecting the same by adjustable links and wedges at their upper corners, and supporting said sections by chains placed between and at right angles thereto."

35. For an *Improvement in Grain and Grass Harvesters;* George W. N. Yost, Pittsburgh, Pennsylvania.

Claim.—"The combination of the racks and king bolt, arranged for adjusting the cutter bar of harvesters."

36. For an *Improvement in Door Springs;* Alvin Barton, Assignor to self and A. R. Morgan and J. M. Parsons, Syracuse, New York.

Claim.—"The employment of the eccentric cog wheels, in combination with the coiled spring, lever, and guide rod, attached to the door or gate."

37. For an *Improvement in Bridges;* George W. O. Huggens, Assignor to self and Charles Bender and D. F. Tiedman, St. Louis, Missouri.

Claim.—"The combination of and between those mechanical agencies and technical

parts which constitute the mode to prevent vibration in a bridge by using the compensated effect of compression only. Also, the combination of and between the mode in which the arches are arranged, and across each other, and the mode in which they are connected with the flow; and, finally, the mode in which they receive their leverage, the mechanical effect of which said combination is to originate the tendencies in the upper and lower arches to curve apart or asunder. Also, the combination of and between the mode in which the arches cross each other, and the mode in which they are connected with the floor; and the mode finally, in which they are constructed, in regard to amount of material, the mechanical effect of which said combination, is to originate the equal intensity of the said tendencies. Also, the employment in the bridge construction of the arches, as a practical substitute for upper cords, and generally, for all such parts in bridges, which serve to uphold the floor. Also, the special mode in which the arches are connected with the floor."

38. For a *Machine for Making Carpet Lining;* John R. Harrington, Dayton, Ohio.

Claim.—"1st, The arrangement of the horizontal spindles or rollers, on which the outer sheets or rolls of paper or cloth are wound, in combination with the intermittent spindle on which the inner layer of cotton or other filling is wound. 2d, The arrangement of the rolls, in combination with the spindles. 3d, The troughs that contain the size or mucilage, and the brushes that administer it, when used in combination with the spindles. 4th, The creasing rolls, when used in this connexion, each having alternate grooves and ridges, at their requisite distance for the folds, for the purposes of folding and measuring. 5th, In this connexion, the box or platform, placed below the delivery of the rolls, and having a falling front."

39. For *Improved Skates;* Fernando Klein, Newark, New Jersey.

Claim.—"The iron bar, attached to the heel plate, and having two knobs."

40. For an *Improved Fishing Lead;* Wooster Smith, South Thomaston, Maine.

Claim.—"The improved shape of my lead; the improved mode of fastening the long part of the fish line to the swivel in the top of the lead; the cap of iron, brass, or other hard metal, on the bottom, or descending end of the lead; the horse line running through the lead at the bottom end, the swivels and rings attached to the ends of said horse line, to which rings of the swivel, the small lines to which the hooks are attached, and said swivel in the top of the said lead, to which said long part of the fish line is fastened."

APRIL 8.

41. For an *Improvement in Machines for Drying Wet Grain, &c.;* Stephen V. Appleby, City of New York.

Claim.—"The application of revolving cylinders, situated in a heated flue, with their ends projecting into flues into which cold air is forced, and so arranged, that grain or other similar substances, put into the top cylinder, will slide through the same, and then fall into the next cylinder, and so on from one to the other, being in its passage alternately subjected to the action of heat, while in the cylinder, and to the action of cold air, while falling from one cylinder into the other."

42. For an *Improvement in Enclosing Propeller Shafts in Keels;* Aaron Arnold, Troy, New York.

Claim.—"The manner of enclosing propeller shafts in keels made of sheet iron, or other material, fastened to the vessel's bottom."

43. For an *Improvement in Looms;* Erastus B. Bigelow, Boston, Massachusetts.

Claim.—"Connecting the tension roller, or its equivalent, with the let-off motion, to regulate the delivery of the warps by the arm or feeder. Also, the devices for holding the tension roller, or its equivalent, firmly at the beat of the lathe. Also, the mode of constructing the belt cam, and combining it with the shipping lever. Also, the mode of connecting the friction brake with the shipper and stop motions of the loom. Also, releasing the said friction brake, to allow the loom to be turned by hand."

44. For an *Improvement in Cooking Ranges;* John Plant and Charles G. Ball, Washington, D. C.

Claim.—"The arrangement of the fire chambers, ovens, and front plate, in such relation to each other, as to admit the products of combustion to pass through the flue, over the top plate of the oven, thence down through the flue in front of the fire chamber to the flue beneath the oven."

45. For an *Improved Waste Attachment for Hydrants;* Edward J. Baker, Baltimore, Maryland.

Claim.—"The application to a hydrant of the receiving chamber and piston."

46. For an *Improvement in Pressure Bells;* Jason Barton, Middle Hadam, Conn.

Claim.—"So suspending the hammer, by a point near the top of the bell, but out of the centre thereof, as that the said hammer shall swing from a point near the edge of the bell into the top part of the interior of the bell, and vice versa, thus allowing it a downward velocity and a very long movement, and, at the same time, allowing it to strike the bell near the edge, and at right angles, or nearly so, to its surface."

47. For an *Improvement in Door Fasteners;* G. H. Lindner, Hoboken, New Jersey.

Claim.—"The two catches, provided with hooks or curves at their ends, which hooks or curves pass around the pin attached to the sill or lintel of the door or window frame, the catches being fitted within the case, which is attached to one of the doors or windows; the catch being provided with projections, against which, the bar attached to the other door or window, acts."

48. For an *Improvement in Fastening Door Knobs;* Nathan Benham, Hartford, Connecticut.

Claim.—"In securing the shaft to door knobs in the use of the slotted shaft, with the wedge-shaped hole; said shaft being opened by a screw, or its equivalent."

49. For an *Improved Machine for Combing Seed off Broom Corn;* George E. Burt, Harvard, Massachusetts.

Claim.—"The combination of the wheel, or its equivalent, (such as a rim or a circle,) having one or more rows of teeth in its periphery, with one or more cylinders placed parallel, or nearly so, with the plane of the wheel. Also, the bar. Also, the spur roller, in combination with the plate."

50. For an *Improvement in Shot Guns;* George Buckel and Edward Dorsch, Monroe, Michigan.

Claim.—"Giving the bore the undulating form."

51. For an *Improvement in Magneto-Electric Machines;* Calvin Carpenter, Jr., Providence, Rhode Island.

Claim.—"The cut-off, consisting of the geared segments, and gear wheels or wheel, and thus serving the purpose of springs, and driving a revolving prism, or its equivalent, for rapidly breaking the current."

52. For an *Improvement in Rotary Pumps;* Thomas Crane, Fort Atkinson, Wis.

Claim.—"Connecting the shaft to the hub, in such manner, that without opening the pump case, the periphery of the annular piston can, at any moment, be forced outwards into close contact with the periphery of the pump chamber."

53. For an *Improved Sash Fastener;* Thomas J. Crooke, City of New York.

Claim.—"Combining with the bolt of a self-acting latch, an engaging and disengaging catch."

54. For an *Improved Tempering Furnace;* Robert B. Fellows, Shelburne Falls, Mass

Claim.—"The combination of the plate and the tubes, with a single fire."

55. For *Improved Flood Gates;* George W. Flanders, Lynn, Mass.

Claim.—"Constructing the gate of one part, and hanging or hinging its lower end to the apron or bottom of the flume."

56. For an *Improved Vise;* Orlando V. Florey, Yellow Springs, Ohio.

Claim.—"The use of the ratchet brace, operating in connexion with the ratchet, sliding beam, and movable jaw."

57. For an *Improved Machine for Planing Felloes;* A. W. Fox, Athens, Penna.

Claim.—"The arrangement of the movable pinions, gearing respectively into the series of cogs on the crown wheel, in combination with the device for gearing and ungearing said pinions at the proper moments, whereby the carriage is automatically fed along slowly, then returned at a more rapid rate, and finally stopped, while the cutters

continue to revolve with uniform motion. Also, the combination of the clamping apparatus with the lever, arms, and spring, for the purpose of automatically releasing the felloes. Also, the device for throwing the felloes from the machine."

58. For an *Improvement in Piston Valves for Steam Boiler Regulators;* William S. Gale, City of New York.

Claim.—"The lip of the piston cap, and the spring, arranged in relation to each other and to the piston body, for the purpose of clamping the packing."

59. For an *Improvement in Machines for Polishing Leather;* William P. Gamble, Philadelphia, Pennsylvania.

Claim.—"Effecting the rectilinear motion of the flint or glass, when in contact with the leather upon the strap, by means of the compensating devices."

60. For an *Improvement in Carriage Coupling;* William Greenleaf, Greenfield, Ohio.

Claim.—"The application of the moving rods, the circular T plate, and half circle."

61. For an *Improvement in Submarine Lanterns;* Charles M. Gould and Charles B. Lamb, Worcester, Mass.

Claim.—"1st, The two concentrically arranged glass cylinders, having an air space between them. 2d, The air chambers, with the communicating perforations and spring valves, in combination with the feed and escape pipes."

62. For an *Improvement in Machines for Sifting Coal and other Articles;* Samuel Harris, Springfield, Mass.

Claim.—"The providing of the pins on the underside of the cover of the sifting box, in such relation to the bottom of the vibrating sieve, that when the top of the box is closed, and the sieve vibrated back and forth, they shall separate the material being sifted, and thus improved, and facilitate the sifting operation; and when the top of the box is opened, they shall be out of the way, and thus allow for the convenient removal and replacement of the sieve."

63. For an *Improvement in Processes for Extracting Oil from Cotton Seed;* Augustus A. Noyes, Boston, Mass., Assignor to George Ashman and Charles Phelps, Springfield, Mass.

Claim.—"The maturing of the cotton seed, after it has been separated from the cotton, by heat artificially applied, so as to render the husk brittle and easily separable from the kernel."

64. For an *Improved Arrangement of Slide Valves and means for Operating them;* William N. Henderson, Baltimore, Md.

Claim.—"The arrangement of the valves, and the means for operating them, by which the entire exhaust is controlled by a non-pressure valve, enclosed and working within the balanced cut-off induction slide valve, and worked by separate mechanism, in the same plane; the time or cut-off and exhaust being variable at pleasure, and in no way connected or affected by the movement or operations of each other."

65. For an *Improved Machine for Tapering Whalebone for Whip Handles;* Liveras Hull, Charlestown, Mass.

Claim.—"Confining with the cutter cylinder, and the bed plate of the machine mechanism to operate against, and be operated by the sides of a stick of whalebone, and so as to control or regulate the vertical movements of the rotary cutter cylinder. Also, constructing the cutter cylinder and combining it with the plate."

66. For *Improvements in Machines for Mixing Lime and Sand for Mortar;* Henry W. Hunt, Peekskill, New York, and John Sands, Greenwich, Conn.

Claim.—"The combination of the annular bed and wheel, attached to the rotating and drag."

67. For an *Improvement in the Construction of Envelopes;* Robert T. Knight, Philadelphia, Pennsylvania.

Claim.—"The lapping and interlacing of the ends, and the full width, the back being the full width and length, turning over the enclosed letter, so that when the clasps are in, it is impossible to open it without detection. Also, the application of the metal clasps to the envelope and letter, or both together, making it one and the same parcel, for the

better security of the contents, and also to fix the date of mailing the enclosed letter, which is highly important in many legal and public documents."

68. For an *Improvement in Locks;* William Maurer, City of New York.

Claim.—"The tumblers, having slots made in them, in combination with the slotted bolt, bolt catch, arm or lever and bit."

69. For *Automatic Thermo-hydro-Olaio Pneumatic Valve;* Earl Parker and Wm. Reynolds, East Hartford, Conn.

Claim.—"The employment, when combined of oil and water, or their equivalents, for the automatic closing or moving of the valve, by expansion of the said fluids in their liquid state. Also, the arrangement of the inner and outer bells, tubes, perforations of passages and interior piston or valve."

70. For an *Improvement in Door Locks;* Andrew Patterson, Pittsburgh, Penna.

Claim.—"The use and employment of a vibrating bolt, which shall act as a brace between the seat in, or shaft on which it vibrates, and the jamb piece or keeper, into which it falls, without any other leverage, or any other point."

71. For an *Improvement in Charring Wood;* Sandford S. Perry, County of Charles City, Virginia.

Claim.—"The process or mode of charring wood, or, as it is commonly called, "burning charcoal," by the application of hot or heated air to the wood to be charred."

72. For an *Improved Governor Valve for Steam Engines;* E. H. Smith, Cincinnati, Ohio.

Claim.—"The self-adjusting rings and combined with the eccentrics, or their equivalents.

73. For an *Improvement in the Felt Guide of Paper Machines;* P. H. Wait, Sandy Hill, New York.

Claim.—"The employment and use of two crooked levers, hung upon pivots, and operated by connecting rod and guide pins or friction rollers, against which the felt bears, working the rod and levers, changing the position of the roll, by action of the felt."

74. For an *Improvement in Boilers for Cooking by Steam;* Edward Whiteley, Boston, Massachusetts.

Claim.—"The trap and cap, as arranged and applied to the vessel, whereby the latter may be employed either as a boiler or a steamer."

75. For an *Improved Method of Treating Surface Springs;* Anson Wolcott, East Bloomfield, New York.

Claim.—"The use of an inverted vessel, constructed with an edge susceptible of being forced into the clay pan through which the spring issues—said vessel being provided with a discharge pipe, for the purpose of capping springs, so as to admit of surrounding and covering the inverted vessel with clay."

76. For an *Improved Slate Frame;* Edwin Young, Philadelphia, Penna.

Claim.—"A slate frame, made of a single piece of wood, provided with a groove, to receive the edge of the slate, and bent so as to fit it with the ends fastened together."

77. For an *Improved Machine for Making Envelopes;* William W. Cotton, City of New York.

Claim.—"1st, Operating the feeding, gumming, partial and complete folding, pasting and delivering devices, from two shafts, so united that the rotary motion of one shall give a rocking motion to the other. Also, the feeding up of the blanks, by the two feeding plates—each one carrying it up a portion of the distance, and delivering it against the stops or guides, from whence it is carried through the machine and completed. Also, the combined operation of the paste box and pasters, the former operated from the rock shaft, and the latter from the revolving one through the intervention of devices. Also, in combination with the block, the folders, the hinged joints of which are covered, and the swell of the hinges facing each other. Also, in combination with the holders, the sliding cam plates, with their several connexions for operating said folders."

78. For an *Improved Method of Regulating Pumps by Wind Wheels;* Jacob W. Goodwin and Moses C. Hawkins, Edenborough, Penna.

Claim.—"1st, The construction of a wind wheel, with the sails shaped like a funnel and always presenting the open ends of those on one side of the wheel to the blast. 2d, The construction of the float and the lever, with the elevating rod, in combination with the wheel, so constructed as to be raised and lowered, by the rising and falling of the float."

79. For an *Improved Arrangement of Valves for Hydraulic Engines;* John D. Heaton, Dixon, Illinois.

Claim.—"The construction, use, and application of the swinging or vibrating band, valve devices hung on or attached to an axle or shaft, and operated by the slotted connexion rod and wrist pins. Also, in combination with the said valves, the construction and arrangement of the water chests, or the chambers and the compartments, with the pipe."

80. For *Improved Basin Cocks;* Charles Harrison, City of New York.

Claim.—"The screw plug and its valve, actuated by the bent pipe, when combined with the stop."

81. For an *Improvement in Machines for Sowing Seed Broad Cast;* Jesse Lincoln, Uniontown, Pennsylvania.

Claim.—"In combination with the hopper, the seeding roller, provided with open cells passing through it, and rocked through the hopper, to receive and discharge the grain broad cast."

82. For an *Improvement in Corn Planters;* Edward P. Lacey, Rochester, New York.

Claim.—"The annular rim, having inclined projections attached to it; the projections fitting or working over projections on the back of the groove, the toothed rim being placed over the rim."

83. For an *Improved Machine for Polishing Buckles;* Robert G. Pine, Sing Sing, New York.

Claim.—"The combination of the polishing and guide wheels, with the rotating and longitudinally moving shafts, provided with clamps, the shafts working in yielding or elastic bearings."

84. For an *Improved Spoke Shave;* Martin Snow, North Bridgewater, Mass.

Claim.—"My new or improved manufacture of a heel or spoke shave knife, made of one piece of steel, and with both of its starts bent or formed in the shape of springs."

85. For an *Improved Machine for Bending Wood;* Edward J. Updegraff, York, Pennsylvania.

Claim.—"The peculiar method of operating the form upon which the wood is bent, by bringing it hard down upon the platform by means of the screws, and giving it motion by means of the platform beneath it, (whether endless chain or otherwise,) separately and in connexion with the arrangement of the wheels, the screw, the spring, the frame and the slide."

86. For an *Improved Core Bar for Pipe Moulding;* John Demarest, Assignor to The J. L. Mott Iron Works, Mott Haven, New York.

Claim.—"Making core bars for moulding curved, elbow, or branch pipes, and other such like hollow castings, with sustaining plates or rings at the ends."

87. For an *Improvement in Wash-Boards;* Royal Hatch, Assignor to Henry C. Hatch, Stafford, Vermont.

Claim.—"The beaded rounds, when secured in the frame of the board, viz: by having tenons on the ends of the rounds, fitted in the grooved rails, and the beads of every alternate round fitted in the cavities or hollows of the intermediate rounds."

88. For an *Improvement in Boxes for Axles;* Julius Bevin, Assignor to self and Saml. N. Stillman, Unandilla Forks, New York.

Claim.—"The new manufacture of hub box for wheels, which turn upon their axles, to wit: a hub box with a score or groove behind a flanch which partially closes the end of the box, said score affording room for the washer to play within the flanch, and it

also receives a packing to prevent more effectually, the escape of the lubricating matter, and to exclude the dirt from the box and axle."

89. For an *Improvement in Railroad Car Brakes;* R. M. Evans, Assignor to self and Charles S. Gale, Laconia, New Hampshire.

Claim.—"The arrangement and combination of slots of the brake rod, with the chains and brake levers, in such a manner, that one of each pair of levers will be operated immediately by the brake rod, at the end of its respective slot, while the other lever of each pair will be moved in the other direction, by the action of said chains in whichever direction the cars may be moving."

90. For an *Improvement in Oil Cans;* Thomas Priestly, Assignor to Daniel Holden, Saxonville, Massachusetts.

Claim.—"Combining with the oil vessel, and arranging with respect to the discharging tube thereof, a weight, whereby when said oil vessel is overset, the gravitating power of the weight may move the discharge tube into a position from whence no fluid or oil may escape from it. Also, arranging the air inlet tube, so that its opening into the air vessel and its opening for the reception of air, shall be on opposite sides of the axis of the vessel, or with respect to the weight and oil discharge tube."

91. For an *Improved Apparatus for Heating and Ventilating Buildings;* John Sawyer, Assignor to self and Thomas Hale, Fitchburgh, Mass.

Claim.—"The arrangement of the ventilating chamber, with the main hot air flue, the smoke flue, and air heating chamber, the ventilating chamber and hot air flue having valves applied to them—the whole being capable of being used in heating and ventilating the apartments or stories of a building."

92. For an *Improved Machine for Making Envelopes;* William H. Lowe, Albany, N. York.

Claim.—"1st, The cutting out of the blank by a shearing cut, for the purpose of making a smooth cut. 2d, The position of the knife, to economize the waste of paper. 3d, Drawing the blank through the hole in the face plate, thereby giving to the flaps a preliminary fold. 4th, Holding the blank by means of atmospheric pressure, while the folders are operating. 5th, The adjustable blocks. 6th, Drying the gum for the sealing flap, by means of a current of heated air. 7th, Feeding the paper to the knife, by means of the feeding rollers. 8th, The cam movement, in combination with the hollow slide. 9th, The mode of folding the finger."

APRIL 15.

93. For an *Improvement in Power Looms;* Andrew Allen, Wilmington, Delaware.

Claim.—"The combination of the fork on the lifting lever, the stationary hand, and the sliding pin, or its equivalent."

94. For an *Improvement in Calender Clocks;* Edwin Allen, Glastenburgh, Conn.

Claim.—"The lever with its pin attached to the wheel, and the eccentric applied to the lever, in combination with a spring, for the purpose of controlling the operation of the said lever, in combination with the pins, in all positions of the clock movement."

95. For an *Improved Machine by which Cattle Raise Water for themselves;* J. A. Ayres, Hartford, Conn.

Claim.—"The combination of the bucket with the faucet attached—platform and wheel and axle—the above parts being connected by the ropes or chains."

96. For an *Improvement in Securing and Releasing Blocks of Lasts;* Andrew J. Barnhart, Hartfield, New York.

Claim.—"The fastening or catch, arranged so that the insertion of the lever or last hook, will disengage it, and allow the block to be freely removed."

97. For an *Improvement in Coal Stoves;* W. W. Binney, Seneca Falls, New York.

Claim.—"The partition, placed within the cylinder, and provided with a damper, the vertical tube or pipe, also within the cylinder, and the hollow base, provided with a register."

98. For *Improved Arrangement of Means for Operating Cut-off Valves of Steam Engines;* Henry E. Canfield, City of New York.

Claim.—"The spring cramps as arranged, in relation to the sliding bar of the governor."

99. For an *Improvement in the Arrangement of Grates and Dampers for Chimneys;* Jacob Cohen, City of New York.

Claim.—"The arrangement of the centrally suspended damper, in relation to the grate and the surfaces of escape passage into the chimneys."

100. For an *Improved Stump Extractor;* J. B. Creighton, Tiffin, Ohio.

Claim.—"The combination and arrangement of the vertical screw, the nut and the rollers, with the bearing plate and frame, the lever carrying a wheel, in combination with the frame, so as to expedite and facilitate the transportation of the machine."

101. For an *Improvement in Omnibus Registers;* Levi Cromwell, Baltimore, Md.

Claim.—"The use of the bar, for the double purpose of a stop, by which the operating pawl shall at the end of its thrust be confined within the circle of the ratchet teeth of the wheel, and thus lock it, and of a medium, by which to apply a strong force through the sliding lever or drop leaf, or its equivalent, to the spring of the pawl."

102. For an *Improved Lock Hasp;* M. Newman, 2d, Oak Hill, New York.

Claim.—"The sliding jaw or head, and the hook attached or fitted to the plate or bed, and operated by the lever and rack."

103. For an *Improvement in Churns;* William Newbrough, Mohican, Ohio.

Claim.—"The combination of the oblique bulged rockers with the diagonal separator, for producing a violent agitation of the cream."

104. For an *Improved Wheel Hub;* Joseph Summers, Raleigh Court House, Virginia.

Claim.—"My improved wheel hub, composed of the pipe box, and its radially grooved central flanch, combined with the half hubs, and their radially grooved flanches, and with the embracing band."

105. For a *Preparation of Oil Ground, to receive Photographic Impressions;* Joel H. Tatum, Baltimore, Maryland.

Claim.—"The mode of preparing and rendering oil prepared surfaces impressible or sensitive to the photographic art, by the temporary destruction or chemical change of the oil on the immediate surface, by the use of the spirits of wine and alkaline solution, and then the fixing the impression by the use of hyposulph. soda, and diluted acid, by which last application, the alkalies are neutralized, and the oil restored with the impression permanent upon the surface."

106. For an *Improvemevt in Vault Covers;* William D. Titus, Brooklyn, N. Y.

Claim.—"The combination of the pivoted cross bar, attached to the under side of the top of the vault, and the spring catches fitted to the stem projecting from the under side of the cover. Also, the employment of the hinged forked drop lever, for the purpose of releasing the spring catches."

107. For an *Improvement in Railroad Brakes;* Benjamin T. Trimmer, Parma, N. Y.

Claim.—"1st, The combination of the secondary brake rods with the tumblers, said tumblers being firmly attached and supported by it. 2d, The combination of the hand wheel and secondary brake rods, said combination performing the double function of braking the wheels of the car to which it is attached, and raising the tumblers to operate the other brakes. 3d, The combination of the rock shaft with the extensible and elastic chain, by which the forward motion of the engine relaxes the brakes, without danger of breaking said chain."

108. For an *Improvement in Electro-magnetic Engines;* Maurice Vergnes, City of New York.

Claim.—"The concurrent action of two or more electro-magnets, parallel and with contrary adjacent poles, revolving upon an axle common to both, within a double multiplying coil, arranged or running between and on the outside of the magnets, in opposite directions, and acting upon both sides or faces of the magnets."

109. For an *Improvement in Wigs;* DeWitt C. Warner, Wilkesbarre, Penna.

Claim.—"Attaching the hair to a ground work of gutta-percha, by means of the adhesive property of gutta-percha, as developed by the application of heat."

110. For an *Improvement in Stone and Marble Saw;* Henry H. Whitey and Edward A. Gray, East Poultney, Vermont.

Claim.—"The combination of the tubes, wires, organs, keys, or their equivalents, when provided with a rubber covering, or its equivalent."

111. For an *Improved Door Spring;* Gilbert L. Bailey, Portland, Maine.

Claim.—"The spring, crank arm, and rod, operating in connexion."

112. For an *Improvement in Grain Weighing Machines;* William H. Bramble, Cincinnati, Ohio; ante-dated, April 8, 1856.

Claim.—"1st, The double chambered oscillating vessel, when combined with and forming part of an automatic weighing apparatus. 2d, Dividing the vessel into two compartments, by means of a longitudinal flexible partition, when the said vessel is arranged with and forms a part of a weighing apparatus. 3d, The combining gates of different sizes with the conducting chute, and with apparatus that can be operated by the vibration of the scale beam. 4th, The combination of the double gates with each other, and with the ratchet wheels, the retaining click and the detaching movements. 5th, Detaching the click which holds the gate or gates in an open position, through the medium of a vertical tilting lever, combined with the scale beam. 6th, The arrangement of the auxiliary weighing poise and the movable table, when the said table is combined with and operated by the gate."

113. For an *Improvement in Adjusting the Angles in Machines for Sawing Marble Obelisks;* Lebbius Brookes, Great Falls, New Hampshire.

Claim.—"The peculiar combination of mechanism, by which each of the saw frames is moved relatively to the other, and so as to dispose its saws either in or out of parallelism with those of the other, as circumstances may require—the same consisting of the upright rod, the bell crank rod, their slides, staple guides—the same being applied to the main frame and a saw frame. Also, combining with each of the bell crank shafts and the rod, and each of the saw frames, and its suspension rod, the movable frame, whereby said suspension rods are adjusted or moved, at their lower ends and in the same directions."

114. For an *Improved Method of Hanging and Elevating or Depressing Farm Gates;* J. Francis Downing, Erie, Penna.

Claim.—"The part of the hinge and the application of the lever as a means of elevating and lowering the gate, including the manner of obtaining the fulcrum or point of purchase, by attaching a rod to any convenient point on the large post."

115. For an *Improvement in Air Engines;* John Ericsson, City of New York.

Claim.—"What I claim in the engine for producing motive power with heated air is, by means of a piston working within a cylinder, under a mode of operation, performing the successive combined operations of simultaneously discharging the heated air, and taking in the charge of cold air, compressing and transferring it to a regenerator and heater, or either, and thence to the opposite end of the cylinder, to act upon and impel the piston."

116. For an *Improvement in Attaching Thills and Poles to Vehicles;* Abram J. Gibson, Clinton, Massachusetts.

Claim.—"The manner of attaching thills to vehicles, by means of broad iron hinges, independent of each other, without a cross bar."

117. For an *Improvement in the Mode of Protecting Vines;* Abel H. Grennel, Springfield, Vermont.

Claim.—"The so constructing the lattice frames, that they may be swung with the vines upon them, into a compact form, and be protected by closing around them, the double doors, to protect the vines from the weather."

118. For an *Improvement in Frames for Musquito Nets;* Samuel E. Hartwell, City of New York.

Claim.—"The arrangement for securing the ribs rigidly in position when expanded; that is to say, the radial groove or knob, in combination with the grooved clamp."

119. For an *Improvement in Straining Marble Saws;* William B. Hatch, Elmira, N. York.

Claim.—"The rectangular saw frame, constructed with centre bars and tension braces, for straining the saws."

120. For an *Improvement in Manufacture of India-Rubber;* Nathaniel Hayward, Colchester, Connecticut.

Claim.—"The improved process of cementing and uniting one piece of vulcanized rubber with another piece of rubber, either vulcanized, or in a state capable of being vulcanized."

121. For an *Improvement in Machines for Sawing Marble in Obelisk Form;* J. E. Haviland, Galveston, Texas.

Claim.—"Adjusting the saw frame F, more or less angularly or obliquely with the saw frame D, by means of the adjustable or sliding plates, which are fitted over curved surfaces on the cross pieces of the frame."

122. For an *Improvement in Spreading Rollers for Stretching Cloth;* Jonathan J. Hillard, Fall River, Massachusetts.

Claim.—"As a new and useful improvement on the revolving reciprocating spreader, the jointed and pivoted arrangement of the serrated stretching bars, with the obliquely set wheels, on or round the axis of the spreader, by means of the loose radial spokes and transverse pivots, for connecting the stretching bars with the obliquely set revolving wheels, and whereby increased freedom in the longitudinal play of the bars is obtained, and the cloth thereby more easily and effectually stretched without injury, and without the interposition of lubricating material, when such would be apt to soil the cloth."

123. For an *Improvement in Bedstead Fastenings;* William Hinman, Elkhart, Ind.

Claim.—"Giving an upward inclination to the upper surfaces of the tenons on the side boards and on the head and foot boards, and a corresponding shape to the mortises in the sections of the posts, that receive said tenons, by which the action of the screw connexion between the upper and lower sections of the posts, are enabled to form a close jointed and perfect union between the rails, the head and foot, and the sectional posts."

124. For an *Improvement in Grain and Grass Harvesters;* William H. Hovey, Springfield, Massachusetts.

Claim.—"Providing the front ends of the cutter and sickle bars, with lips or projections—the lip or projection bearing upon ledges on the fingers."

125. For an *Improvement in Candle Cutting Apparatus;* John Jones, Brooklyn, New York.

Claim.—"1st, The concave guiding surface, as a means of gauging the candle's length taken at its axis. 2d, The combination of the sliding box with the cutter, operating for the purpose of cutting candles of equal length, taken at their axis."

126. For an *Improvement in Hay and Cotton Presses;* Simon Ingersoll, Green Point, New York.

Claim.—"Operating the follower by means of the levers attached to swinging frames, and connected to the clamps, for lifting the follower bars, the retaining clamps or their equivalents being employed for sustaining or holding the follower, when the bar are released from the clamps."

127. For an *Improvement in Safety Platforms between Railroad Cars;* James Kline, Jr., and Simon V. Kline, Chicago, Illinois.

Claim.—"The peculiar construction of a connecting safety platform between railroad cars."

128. For an *Improvement in Hoisting Drums;* George W. La Baw, Jersey City, New Jersey.

Claim.—"Constructing the coilers hollow and with a slot in them for the passage of the rope, together with the spring, or equivalent, for the purpose of holding and protecting the surplus rope."

129. For an *Improvement in Fire Arms;* Palmey Lancaster, Burr Oak, Mich.

Claim.—"The operation of the transversely sliding chambered breech, by means of the notches in the breech, and the swinging inclined tooth applied to the trigger."

130. For an *Improvement in Metallic Bedsteads;* Marshall Lefferts, City of N. Y.

Claim.—"The combination of the angle iron side rails, with the corrugated or ∩ formed cross bars and straps."

131. For an *Improvement in Whip Sockets;* William H. Lyman, Newark, N. J.

Claim.—"The application of a piece of sheet india-rubber to the common whip stock, so as to secure the whip to its place, and to prevent dirt, moisture, and other injurious substances from entering the socket, and causing damage to the whip."

132. For an *Improved Stereoscope Case;* William Loyd, Philadelphia, Penna.

Claim.—"The construction of a grooved box, in combination with the stereoscope lenses, to hold a number of pictures, and the adjustment of the focus, by means of placing the picture in one of the grooves, more or less distant from the lenses, according to the eye-sight of the spectater."

133. For an *Improvement in Apparatus for Hoisting Coal;* George Martz, Pottsville, Pennsylvania.

Claim.—"Supporting the hoisting carriage upon outer and inner sets of wheels, arranged in such a manner, in relation with the double sets of railway tracks, and the discharging shute, that the coal car in said hoisting carriage, is made to self-discharge its load of coal into said shute. Also, so proportioning and arranging the respective parts of the hoisting carriage and the coal car, that as soon as the elevating power is detached from said carriage, it will, by the force of the gravity, run back to the bottom of the slope track, and re-station itself in the proper position for discharging its empty coal car and receiving a loaded car."

134. For a *Double-acting Catch for Reversible Backs of Settees;* B. F. M'Creary, City of New York.

Claim.—"The turning catch plate, made to tilt either way, by a weighted arm, and having two catches, so applied as to form a catch for the back on one side only of the seat, in one of the tilted positions of the catch plate, and on the other side only of the seat in the other tilted position of the catch plate."

135. For an *Improved Implement for Reaping Rice;* W. J. M'Intosh, Savannah, Ga.

Claim.—"The cutters, in combination with the wire, and the cradle and slides."

136. For an *Improved Apparatus for Feeding Furnaces with Fuel;* Alexander M. Sprague, Mobile, Alabama.

Claim.—"The furnace-feeding apparatus composed of a cylinder, or box or other form, sliding through an opening in the furnace front, having its inner end closed, and an opening in the bottom being fitted with a door at its outer end, and with a piston and sliding shutter."

137. For an *Improved Diaphragm Water Metre;* R. L. Hawes, Worcester, Mass.

Claim.—"The elastic diaphragm, so constructed and arranged as to operate without attachments to the moving parts, and without being subjected to strain."

138. For an *Improvement in Electric Telegraph;* Charles Kirchhof, City of N. Y.

Claim.—"1st, The prevention of the too early intermission or restoration of the circuit, in the use of self-intermission through the method by which a key shuttle, or its equivalent, is not only stationary during the whole travel of the armature, but also for a certain time afterwards, so that the circuit, during that time, remains either permanently broken or closed, but afterwards this shuttle is started and shoved by the indirect influence of the motion of the armature, through some devices, till to the moment of breaking or restoring the circuit and here stopped, and the armature, and by that, all oscillating mechanical parts are obliged to reverse immediately. 2d, The manner of stopping the index of all instruments of a circuit right opposite the desired letter, without disturbing or preventing the index armature or shuttle on any instrument, to complete their adopted motion, by means of a 'watcher' and 'waker,' operated by the revolving hook and key lever, or its equivalent, so that the watcher will keep open; meanwhile the shuttle makes contact, whereby the indices stop until the key is relieved, and the watcher closes again. 3d, The method to keep all instruments of a circuit in unison, working and without any mechanical means through employment of 'the induction current,' by retarding the influence of the electro-magnetic power at a certain degree upon that instrument which intermits the circuit, not having their intermitters in activity, are governed by it and

insured to complete their motion before the circuit of the prime current is intermitted or restored again. The said induction current, in each instrument, being used in connexion with some suitable means for connecting and disconnecting the self-intermitter with the armature lever, and also with a means for closing and opening the induction circuit, and for the opening and closing of the accommodation course of the prime current, which act together, at once answering simultaneously their different purposes."

139. For an *Improvement in Harvester Raking Attachments;* William H. Hovey Springfield, Mass.

Claim.—"1st, The swinging rake, in combination with the reciprocating rake, when said rakes are used in combination with the device for operating the rake, formed, viz: of the catch lever with pin attached arms, and the bar attached to the rake, whereby the proper movements are given at the desired time to the rake. 2d, Operating the reciprocating rake, by means of the chains attached to said rake, and passing around pulleys and attached to the pulleys, which pulleys are turned or operated alternately by the wheel having teeth upon its outer and inner peripheries."

140. For an *Improvement in Grain and Grass Harvesters;* William A. Kirby, Buffalo, New York.

Claim.—"The manner of attaching fingers, as constructed with semi-circular recesses, whereby they are secured to the angle iron finger bar by bolts, without reducing the strength of bar of the finger while the bolts themselves, serve the double purpose of securing the fingers, and as guides to the cutter bar. Also, the use of the rivets, when projecting above and below the cutters, and used with the interspace and recesses of the fingers."

141. For an *Improvement in Repairing Railroad Bars;* James M'Lellan, Detroit, Michigan.

Claim.—"Placing the rail or bar to be heated within a cooler, which is fitted within the furnace, and supplied with water from a reservoir at the outer side of the furnace—the cooler being so formed or arranged, as to encompass or be in contact with the parts of the rail bar not designed to be heated."

142. For an *Improvement in making Brass Kettles;* O. W. Minard, Waterbury, Connecticut.

Claim.—"The employment of the clamps or holder, in combination with the working rollers, for drawing or working, for the purpose of forming a disk of metal into a kettle, without employing a mould or former therefor. Also, the combination of a centre-piece, for holding the disk of metal and disk, by which the bottom of the article being manufactured is formed, by the combined action of the disk, and drawing or working apparatus."

143. For an *Improved Machine for Folding Paper;* John North, Middletown, Conn.

Claim.—"1st, Folding paper by means of a stationary straight edge or knife and folding nippers. 2d, The manner of relieving the sheet from the nippers. 3d, The adjustable check, and the mode of releasing its hold, by the advance of the nippers. 4th, The rotating trip dog, for raising and depressing the fingers. 5th, Attaching the knives to the reciprocating carriage. 6th, Operating the reciprocating carriage, by means of the crank, the slotted connecting rod, the lever, and the link, whereby I attain accuracy and ease of movement. 7th, The cutting rollers hung on a bar, vibrated and checked. 8th, The arrangement of the T levers, with the double concentric rock shafts, for operating the nippers by one cam."

144. For an *Improved Machine for Raising and Creasing Leather Straps, &c.;* Geo. W. Pruyne, Mexico, New York.

Claim.—"In combination with the grooved rolls, one of which is yielding, the guides through which the creased part of the strap is drawn, and so that said guides shall serve to direct the finished strap, as it passes between the rolls."

145. For an *Improvement in Cut-offs for Steam Engines;* John S. Shapter, City of New York.

Claim.—"Holding up the poppet steam valve of a steam engine, by the fluid contained in a supporting chamber, and adjusting the discharge of said fluid from said chamber, for the purpose of dropping said steam valves, and cutting off the supply of steam to the cylinder, at different points, as may be required."

146. For *Improved Head and Tail-blocks for Saw Mills;* E. H. Stearns, Cincinnati, Ohio.

Claim.—"1st, The eccentrics, one, two, four, more or less, or their equivalents, in combination with the setting arms and ratchet racks, or their equivalents, for the purpose of moving and setting the log laterally to the saw. 2d, The combination of two or more pieces, composing the sliding dogs, passing through one or more openings on the same side of the saw, so near each other, that they may be driven in or out of the log, by the same blows of the mill bar—the ends of these dogs being so beveled or chamfered, as to cause them to bind and tighten themselves in the openings through which they pass—which dogs may be made in separate parts, or jointed partially to their heads, but not so close or firm as to prevent the parts from binding in their openings when driven into the log. 3d, The combination of the levers and recess, made in the under part of the sliding head in the foot block, and operated by the motion given to the sliding head, which combination forms an extra safety trip, for stopping the saw carriage when the dogs come opposite the saw, to prevent the saw from striking the dogs, which are operated by the motion given to the sliding head."

147. For an *Improved Puddle Ball Squeezer;* Shubael Wilder, New Castle, Penna.

Claim.—"The employment of the circular flanch, constructed in sections, the same being connected by beveled dove-tailed joints."

148. For an *Improvement in Weighing Scales;* R. F. Woleott, Claremont, N. H.

Claim.—"The arrangement of the compound weighing poise with the screw, and with the sides of the scale beam, in such a manner, that the said poise may be either lifted from place to place upon the beam, or be moved gradually thereupon, by turning the said screw."

149. For an *Improvement in Seeding Machines;* Thomas A. Risher, Assignor to self and J. R. Cooper, Lancaster, Ohio.

Claim.—"Bars and plates, in combination with the reciprocating slides, and the double holed bottom."

150. For an *Improved Awl Haft;* Benjamin James, Assignor to Roswell E. James, Worcester, Massachusetts.

Claim.—"Improved mode of constructing an awl haft, viz: of two levers crossing one another, turning on a common fulcrum, and provided not only with jaws like a pair of fingers, but with a chamber in one or both of the handle arms of said levers. Also, forming the rear end or part of one of the levers with an extension, and so as to lap over the end of the other lever, and receive an entire hammer head upon it."

151. For an *Improved Method of Adjusting Circular Saws for Concave or Convex Work;* James M. Kern, Assignor to Enoch P. Fitch and Isaac Scott, Morgantown, Virginia.

Claim.—"The arranging a circular saw with its followers upon a shaft, so that said saw may be converted from a disk to a concave saw, or vice versa, without removing any of the parts from the shaft."

APRIL 22.

152. For an *Improved Fishing Tackle;* Julio T. Buel, White Hall, New York.

Claim.—"1st, A hook with two barbs. 2d, Making the hook having two barbs in two parts, and uniting said parts loosely together, so that one shall turn free of the other. 3d, Combining with the barb, one or more minnow barbs, and having one of the barbs turn free of the barb."

153. For an *Improvement in Seeding Machines;* George A. Bitler, Lancaster, Ohio.

Claim.—"The reciprocating slide having different sized holes made through it, in combination with the adjustable bottom and adjustable plates; said slide being also arranged in combination with and operated by the pulley."

154. For an *Improved Machine for Sowing Fertilizers;* Warren S. Bartle, Newark, N. Jersey.

Claim.—"The distributors, composed of the radials, in combination with the shaft and fender."

155. For an *Improvement in Balance and Slide Valve for Steam Engines;* Alexander Buchanan, City of New York.

Claim.—"The means of maintaining the differential pressures on the two sides of the valve, necessary for balancing the same, that is to say, the combination of an apparatus with the valve."

156. For an *Improvement in Brick Machines;* Patrick S. Devlan, Reading, Penna.

Claim.—"In combination with a stationary mould and a reciprocating piston or plunger, an intermittently rotating, feeding, and conveying apparatus, through which the plunger passes, to compress the clay, and form the brick, and which remains to receive the brick as if ejected from the mould, and carries it forward and out of the way of the succeeding clay box."

157. For an *Improvement in Cultivators;* George Esterly, Heart Prairie, Wis.

Claim.—"The hanging of two or more ploughs to a supporting beam or axle, by swiveling joints at each of the ends of their drag bars, so that said ploughs may be moved either way laterally, without affecting the axle, and still maintain their parallelism; and this I claim, whether the stock to which the ploughs are connected be adjustable in the drag bars, or the ploughs be adjusted in the stock or otherwise."

158. For an *Improved Machine for Digging Peat;* Abraham Fitts, Worcester, Mass.

Claim.—"1st, The movable knife or fork. 2d, The digger, consisting of two or more blades, in combination with a movable knife or fork, to cut the third side or sides. 3d, The combination of the digger, the crane, and the platform, or cars, to hold them and receive the peat."

159. For an *Improvement in Revolving Fire Arms;* Gustav. A. Blittkowski and Frederick W. Hoffman, City of New York.

Claim.—"1st, Effecting the ramming of the cartridge by means of the fixed rammer, in combination with the reciprocating breech chamber. 2d, The arrangement for folding and releasing the cartridges—consisting of the clamp spring, the knob upon the axis of the breech chamber, and the magazine for containing a supply of cartridges. 3d, Effecting the several motions required for operating the rotating breech, by means of an axis rigidly connected thereto, and operated from one of the ends of the said axis. 4th, The combination of the slide with the axis of the breech chamber, with the locking bolt, and with the tumbler."

160. For an *Improvement in Receiving Magnets for Telegraphs;* Andrew Coleman, Perth Amboy, New Jersey.

Claim.—"So constructing or applying the armature, and applying the spring, or its equivalent, that the armature constitutes the whole or part of a variable lever, which causes the effective force of the spring to increase or diminish, as the magnetic force becomes greater or less, when this is combined with the so applying the finger, by which the local circuit is opened and closed, that the said finger is caused to move with the armature, by friction only, or its equivalent, and after having moved the slight distance necessary to open or close the circuit, leaves the armature free to move as far as necessary, independently of it, thereby obviating the necessity of manual adjustment of the armature, to compensate for variations of magnetic force."

161. For an *Improved Waste Device for Hydrants;* John Culver, Baltimore, Md.

Claim.—"The arrangement of the plunger relative to the discharge pipe, and capable of elevation proportional to the capacity of said pipe, for forming a chamber in the lower portion of the hydrant, for the reception of the contents of the discharge pipe."

162. For an *Improvement in Door Locks;* John B. Erb, Strasburg, Penna.

Claim.—"The devices of the knob, oval slot, and semi-circular slide, as they operate upon the bolt, all in combination."

163. For an *Improvement in Sugar Evaporators;* Samuel H. Gilman, New Orleans, Louisiana.

Claim.—"1st, The table bottom forming the steam chamber below, and the condensed water chamber above, in connexion with the steam pipes, open at both ends and fixed into the division plate, and, with the evaporating pipes, closed at the top and open at the bottom, and fixed with the tube plate. 2d, The compensating condensed water syphon-pipe, with one leg starting from the reservoir in the steam chamber, and passing

up through the division and the tube plate into the pan, to about one-half of the height of the evaporating pipes, then turning down through the tube plate, and in the same vertical plane with, and terminating in and near the lower end of the condensed water pipe of the condensed water chamber."

164. For a *Machine for Driving Spokes;* Christian Haas and John C. Noll, Chicago, Illinois.

Claim.—"The adjustable hub-bed and spoke guide, in combination with the driving apparatus.

165. For an *Improvement in Hotel Annunciators;* William H. Hale, Worcester, Massachusetts.

Claim.—"The combination of the number plate with a hammer, whereby I am enabled to show the number and strike the bell with the same piece. Also, the arrangement of said tilting number plates, or number hammer, or their equivalents, in ranks upon ranks of wires respectively operating them, the wire passing through slots in the hammer levers."

166. For an *Improvement in the Arrangement of Dampers of Cooking Stoves;* Wm. E. Hayes, Geneva, New York.

Claim.—"The damper connected and operated by the lever and damper rod."

167. For an *Improvement in Steam Boilers;* C. B. Hoard, Watertown, New York.

Claim.—"Closing the openings or man holes, in one or both heads of boilers, by the insertion of a flue, which may be conveniently removed and replaced."

168. For an *Improvement in Preparing Phosphoric Acid as a Substitute for other Solid Acids;* Eben N. Horsford, Cambridge, Massachusetts.

Claim.—"Pulverulent phosphoric acid, for neutralizing alkaline bases, and producing carbonic acid at will, from a mixture of this pulverulent acid with alkaline carbonates, upon the addition of moisture, or heat, or both."

169. For an *Improvement in Suspending Extra Top-sail Yards;* George Hubbard, Stonington, Connecticut.

Claim.—"Arranging the same, or its connexion with the mast, above the cap of the lower mast, and applying said extra yard to the topmast, and suspending it from or near the trestle-tree, whereby said yard may not only be raised up towards said trestle-tree, but be supported, and be capable of being braced around, as occasion may require; and this, without danger of injury to the cap of the lower mast head."

170. For an *Improvement in Flasks for Moulding;* James J. Johnson, Alleghany, Pennsylvania.

Claim.—"The employment of the table, follow board, and plate, the whole, when adjusted by the vertical movement in guides."

171. For an *Improvement in Electro-Magnetic Telegraphs;* Albert J. Partridge, Southbridge, Massachusetts.

Claim.—"The method of operating the circuit hanger, to change the circuit, by means of the clutch and fly wheel, attached to the loose part thereof."

172. For an *Improvement in Coal Breakers;* Thomas Petherick, Pottsville, Penna.

Claim.—"The mode of breaking coal, by causing it to fall from a suitable height, and between proper guards or guides, upon sharp pointed teeth and chisels placed on blocks."

173. For an *Electro-Magnetic Grain Scale;* Nathan M. Phillips, City of New York.

Claim.—"The application of an electro-magnet, to open and close the valve of a scale for weighing grain, by making a connexion between the positive and negative poles of a galvanic battery, by means of the tilting or raising of the beam."

174. For an *Improved Measuring Faucet;* Edwin A. Palmer, Clayville, New York.

Claim.—"The perforated piston in combination with the valve and knob."

175. For an *Improved Apparatus for Raising and Lowering Carriage Tops;* Alanson Quigley, Sheldrake, New York.

Claim.—"The box, cog lever, pawl, and cog wheel, in combination."

176. For an *Improvement in Cast Iron Pavements;* Asa P. Robinson, City of New York.

Claim.—"The cylindrical form with the tangential flat surfaces raised upon its circumference, for contact between the blocks. Also, the peculiar manner of keying the blocks together, and of keeping the blocks to the rails, to prevent vertical motion, and to admit of any one block or rail, or any number of blocks or rails, being moved without disturbing others not required to be moved, by means of the triangular formed spaces, the rebates and the keys, or by means of the projecting surfaces of the blocks and the flanches or lugs on the rails and the key."

177. For an *Improvement in Gas Burners;* William F. Shaw, Boston, Mass.

Claim.—"The interposition of an imperfectly conducting body between the tip and base of gas burners, for the purpose of preventing the conduction of heat away from the point where the gas is burned."

178. For an *Improvement in Working Sheet Metal;* Samuel R. Shepard and Orson W. Stow, Plantsville, Connecticut.

Claim.—"The adjustable rotating guide, attached to either of the rollers."

179. For an *Improvement in Rings for Preventing Nocturnal Emissions;* L. D. Sibley, Northampton, Mass.

Claim.—"The combination of an elastic strip or strips, with an internally toothed ring, in such a manner, that the strip or strips shall serve as a protection against the teeth, until the distension of the penis takes place, when it or they will yield to said distension, and allow the teeth of the ring to act. Also, forming the notches in the edge of the slide, in combination with the spring catch."

180. For an *Improved Conical Tent;* H. H. Sibley, United States Army.

Claim.—"1st, So constructing the tripod, or its equivalent device attached to a single pole, as to admit of easily building a fire. 2d, So constructing a tent with its hood or cowl, in combination with the door and half door or opening, to effect ventilation and the escape of smoke."

181. For an *Improvement in the Method of Fastening Lamps to Lanterns;* Emile Sirret and William H. Scott, Buffalo, New York.

Claim.—"Constructing the lamp with the bottom extending so as to form an annular flanch, which may be revolved with the lamp, independently of the base of the lantern, for the purpose of attaching the lamp to the lantern."

182. For an *Improvement in Projectiles for Fire Arms;* Thomas Smith, Pittsburgh, Pennsylvania.

Claim.—"The construction of balls, or projectiles, for smooth bore or rifle bore fire arms with a spiral cavity, more or less funnel shaped, passing longitudinally through them, for the purpose of giving them a spinning motion, on their long axis, in their passage through the air."

183. For an *Improvement in Pressure Regulating Apparatus for Steam Heating Boilers;* George S. G. Spence, Boston, Mass.

Claim.—"The peculiar arrangement of the steam generator or boiler, the stand pipe, the condensing apparatus, (composed of the receiver, the cover, and the refrigerating vessel,) the safety valve and its pipe."

184. For an *Improved Weather Strip and Lock for Windows, &c.;* Alfred Spear, Passaic, New Jersey.

Claim.—"The combination and arrangement of the devices for operating a weather strip or strips, to effect the double purpose of a weather guard and lock, at the same time."

185. For an *Improvement in Cotton Cleaners;* James H. Kinyon and James Hollingsworth, Chicago, Illinois.

Claim.—"The so arranging of the hopper, feed rolls and brushes, as that they shall draw in the material, divide it into nearly equal parts, and throw one-half in one direction, and remaining half in a contrary direction, to be acted upon by other rolls and brushes."

186. For an *Improvement in Sub-soil Ploughs;* Pells Manny, Waddam's Grove, Ill.

Claim.—"The combination of the circular rotating cutter, separating ring, mould board, and bar."

187. For an *Improvement in Hydro-carbon Vapor Lamps;* Alonzo M. Mace, Springfield, Massachusetts.

Claim.—"The particular arrangement of the bottom of the retort and the jet holes, with respect to the wick tube, whereby the inflamed jets of vapor issuing from the jet holes, are driven downward against the wick tube, and their currents of heat made to ascend against the concave bottom of the retort—the same serving to greatly facilitate the generation of vapor, as well as the heating of the same. Also, combining with the retort, the bell-shaped cap or heel retainer, made of transparent or other proper material."

188. For an *Improvement in Machines for Sawing Marble in Obelisk Form;* James Miller, Buffalo, New York.

Claim.—"The combination of the crank shaft, mounted above the saw frame; the loosely jointed pitman, and the rocking bars, vibrating on fulcra upon the adjustable frames which guide the saws."

189. For an *Improvement in Corn Harvesters;* R. C. Mauck, Conrad's Store, Va., and W. T. McGahey, McGaheysville, Virginia.

Claim.—"1st, The rotary arms, in combination with the packing guides, for effecting the filling of the body. 2d, The employment of a double series of cutters, for cutting the stalk and stump, and thereby admitting the delivery of the cut product without elevation."

190. For an *Improvement in Corn Shellers;* A. H. Stevens, Warsaw, New York.

Claim.—"In combination with the shelling surfaces, the wings, openings, and spiral flanches or ribs, for the purpose of creating and driving through the machine, a blast or current of air, for separating the grain from the impurities."

191. For an *Improvement in divided Axles for Railroad Cars;* Richard Vose, City of New York.

Claim.—"The connecting segments, when combined with the inner ends of a divided axle, and the embracing tube."

192. For an *Improvement in Coffee Pots;* Charles B. Waite and Joseph W. Senar, Fredericksburgh, Virginia.

Claim.—"The arrangement, whereby the steam from the boiler is discharged into the water in the condenser, which absorbs the aroma, in combination for returning the contents of the condenser into the boiler."

193. For an *Improvement in Link Gearing for Horse-powers;* Thomas D. Burk, Assignor to J. C. Miller and C. A. Fowler, Chicago, Illinois.

Claim.—"The mode of converting the motion of an axis rolling around a centre, into an alternating motion, at right angles to the plane described by the rolling axle, by means of the combination of the crank, connecting link, universal joint, and swiveling bolt of the same."

194. For an *Improved Device to allow for Contraction and Expansion in Wire Fences;* Thomas D. Burk, Chicago, Assignor to James Garrett, Ogle County, Illinois.

Claim.—"The application of the key, the lever, the weight, and the stay, to a wire fence."

195. For an *Improved Auger;* Kelsey Curtis, Assignor to the Winsted Auger Company, Winchester, Connecticut.

Claim.—"The making of an extension bar, connecting the small screw on the end of the auger or bit, with the lips or cutters of the auger proper."

196. For an *Improvement in Completing the Throw of the Valves of Direct Acting Engines by the Exhaust Steam;* Henry R. Worthington, Brooklyn, N. York.

Claim.—"Completing the throw of steam valves of direct acting engines, by the steam already within the cylinder on its way to the open air, or to a condenser."

197. For an *Improved Hoop Machine;* George W. Holmes, Buckfield, Maine, Assignor to Jarvis C. Marble, Paris, Maine.

Claim.—"The arrangement and combination of the pressure rollers, the saw and the stand guard, so as to operate together—the said rollers being pressed towards the saw, with variable degrees of pressure. Also, under that arrangement of the saw and pressure rollers, I claim making the saw dishing, or concavo-convex, by which advantages are gained."

198. For *Combined Shovel and Tongs;* Samuel Huffman, Assignor to self and J. D. Brown, Richmond, Virginia.

Claim.—"The flanch and the plate, when combined with a pair of tongs, for the purpose of forming an instrument capable of being used either as a shovel or tongs."

199. For an *Improved Machine for Tunneling and Quarrying;* Ira Merrill, Assignor to self and Arthur Maxwell, Shelburne Falls, Mass.

Claim.—"The arrangement of the proportionate levers."

200. For an *Improvement in Studs for Wearing Apparel;* Lucius Paige, Cavendish, Vermont, Assignor to self and Albert L. Lincoln, Boston, Mass.

Claim.—"Constructing the back disk holder of an ordinary shirt stud or button, with the slit extending from its circumference to the shank, and having one of its edges raised with respect to the other."

201. For an *Improvement in Looms for Weaving Bags;* Samuel P. Thomas, Lawrence, Massachusetts.

Claim.—"In combination with the compound cam, the endless chain or belt, and the mechanism for moving the switch—the whole being arranged for the purpose of determining the length of the sides, or where to form the bottom of the bags. Also, the arrangement by which uniform tension of the warps is secured, during the movements of the harnesses, or in other words, combining with the breast roller or beam, mechanism by which the breast roller or beam may be moved with respect to the lay, or harnesses, and during the movements of the latter."

MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

Notes on the "Ignition Gas Engine." By T. D. Stetson, Mech. Eng.

A large engine, working by the direct explosive force of carburetted hydrogen, was exhibited in the New York Crystal Palace, during the Fair of the American Institute, last Autumn, and at this date remains in the building. By means of a valve, controlled by the operator, the gas was mingled with pretty nearly its combining equivalents of atmospheric air, and exploded in the cylinder; but unlike gunpowder, which, in burning, changes to gas of a permanently greater volume, the combustion of this already rarified mixture produces a mixture of carbonic acid gas, nitrogen, and water, a change which would increase its mean density except for the high temperature momentarily evolved. The absolute degree of heat developed by the combustion of such mixtures has never been definitely established, but at any estimate between the extremes of 1000° and 5000° Fah., it is sufficient to induce a very considerable increase of pressure. This increase alone is in this engine relied on to impel the piston, and as considerable money has been expended on this device, and some attention has been attracted to it abroad, a few notes of its performance may be placed on record as possessing a negative, if not a positive value.

The inventor and exhibitor of this now neglected machine is Dr. Alfred Drake, of Philadelphia. The diameter of the cylinder is 16 inches, the position horizontal, and the stroke of piston 18 inches. One part of gas is mixed with as nearly as possible 9 parts of air, and the mixture is drawn in at the ordinary atmospheric pressure until about one-third of the stroke is performed. The valve is then allowed to close, and the piston continuing on, immediately uncovers a small recess in the side of the cylinder and allows the mixture to come in contact with a mass of metal at an incandescent heat. An explosion sufficient to produce a sensible concussion follows after the lapse of a very short interval. As may be readily seen, the action of this motor is very changeable in its intensity. How great a pressure is obtained at the moment of the explosion, has never been tested by the indicator or otherwise; but theory would indicate an absolute pressure of from 20 to 100 lbs., according as the high or low estimates of temperature be assumed. Whatever the actual maximum heat of the gas, it is evident that it is rapidly diminished by the presence of the metallic surroundings, and the mean pressure may be inferred from the fact that when worked single-acting, it is capable of making about 60 revolutions per minute without load.

These data refer to an exhibition made for the especial observation of the writer, as mechanical reporter for the *Tribune*, and being subject to frequent pauses, the experiment extended over a period of two hours. No brake or other resistance was applied, nor was the engine worked otherwise than single-acting; the valves at one end of the cylinder being allowed to remain at all times open to the atmosphere.

Although the engine is, as may be inferred, intended to be of sufficient power for practical use, and although it was for a long period in daily exhibition in the same locality, the facilities offered for accurate observation of its results have been extremely limited. The gas employed was from the street mains, the same as used for illumination, and no means were available for measuring the quantity consumed during any given short period. The pressure of the mixture until the closing of the induction valve may be assumed at a very little below the atmospheric, but during the short period intervening between the close of that valve and the explosion, the pressure may be supposed to diminish according to pretty nearly the same law as that of steam. How much should be allowed for the effect of the heat previously contained in the metal? It is probable that the fluid as it flows in through a warm passage, and extends itself upon the interior of the cylinder, becomes heated nearly to the temperature of the latter, or sufficiently to produce a very sensible rarification. Whether or not this may be held to be of any sensible importance, it is evident that the amount of gas in the cylinder at the period of the explosion, is too inconsiderable to produce the fullest effects possible to realize from such a device.

The method of igniting is one of the principal novel features of the engine, as might be inferred from its name. In previous attempts to work by the direct expansive force of exploding gases, this point has been considered the chief difficulty. An electric spark has been found impracticable; a jet of gas would of course be extinguished at each explosion; and the only available match which seems to remain, is an intensely heated solid.

Metal, at a sufficiently bright white heat will ignite gas, and the next remaining questions are,—what metal to employ, where to dispose it, and how to maintain its extraordinary temperature? The mode of igniting adopted by Dr. Drake, in the engine now considered, is to insert a hollow cup of thin cast iron, and direct into the cavity a constant blow-pipe flame from the outside. The iron is said to retain its integrity several hours, and often days in this situation, a period considerably longer than platinum will endure when heated in contact with this kind of gas. The rapid destruction of platinum when exposed to this agent at a high temperature, is a fact pretty generally known, and which has been confirmed by every effort yet made to employ the metal in this engine. The feeble performance described above, might probably be much improved by the addition of a compressing pump, which would supply the mixture at a pressure of some 40 or 50 lbs. per square inch. Thus condensed, the force, at the moment of combustion, would rise to as great an amount as could well be availed of.

The high temperature of the contained fluid must of course convey to the metal a great quantity of heat, and to prevent an injurious accumulation, the cylinder is surrounded by a water jacket. Means are also provided for circulating water through the piston, by making the piston-rod hollow, and connecting thereto a flexible tube. This apparatus was not employed on the occasion referred to, and whether or not these precautions are necessary in practice could not be judged from the short periods during which the engine was allowed to work, which rarely exceeded ten or fifteen consecutive minutes.

Taking a general view of the actual performance, the engine although failing to work either quietly or efficiently, gives indications that it is possible to impel machinery by this method with a degree of economy exceeding that of steam. I have not calculated the theoretical saving, and it would be of little importance to do so, as it is evident that but a small fraction has yet been utilized. The inventor avers that any hydro-carbon may be employed in the same manner by mixing the vapor with the atmosphere, and he hopes yet to see locomotives crossing the arid plains and barren passes of the Rocky Mountains impelled by a few barrels of camphene alone. Unpromising as the above results may appear, there is little to indicate that it cannot be done.

In one vitally important respect Drake's gas engine differs from those employing aqueous vapor, *i. e.*, the temperature of the cylinders. Steam engines consume and dissipate heat; this, on the contrary, generates it to a degree supposed to be inconveniently great. A steam cylinder cools and loses its efficacy unless protected by jackets or lagging; this burns itself up, unless water is applied to cool it. When some master spirit shall combine them so that the surplus of heat in one shall give vitality and vigor to the other, a great step will have been taken towards utilizing the full mechanical equivalent of heat. As the invention now stands, it cannot be very highly recommended. The power is violent, vacillating, noisy, and of unascertained economy. The igniters are liable to crack, and are sure to undergo such a chemical change as to be destroyed in a very short period. The absence of a boiler tends very much to its advantage in point of lightness as compared with steam power, and

the necessity for a large balance wheel to soften the shocks and to impel the work during the comparatively long periods while the engine is powerless, might be avoided by connecting two, three, or more engines to the same shaft. But the power has yet to establish its claims to efficiency, nothing having as yet transpired to absolutely prove it practically capable of impelling any machinery except its own necessary apparatus.

New York, May 9th, 1856.

For the Journal of the Franklin Institute.

Particulars of the United States Mail Steamer Adriatic.

Hull built by James and George Steers, New York. Machinery by Novelty Iron Works, New York. Intended service, New York to Liverpool.

HULL.—

Length on deck from fore part of stem to after part of stern-post above the spar deck,	351 feet.	8 inches.
Length on load line,	343 "	10 "
Breadth of beam at midship section, (*moulded,*)	48 "	8 "
" " "	50 "	
Depth of hold	25 "	
" to spar deck,	33 "	2 "

Floor timber at throats, *moulded* 22, *sided* 13 to 16.

Frames, distance apart *at centres,* 33 to 36; strapped with diagonal and double laid iron straps, 5 by $\frac{7}{8}$ inches.

Draft of water at load line,	20 feet.	
Launching draft,	10 "	2 inches.
Area of immersed midship section at this draft,	880 sq. feet.	

Displacement at 20 feet draft, 5233 tons; average displacement per inch from light load line of 17 feet 1½ inches; 26 7-16 tons, and from light load line to load line of 20 feet, 28¾ tons.

Masts and rig—Brig.

ENGINES.—Two—Inclined oscillators.

Diameter of cylinder,		100 inches.
Length of stroke,	12 feet.	
Weight of engines,	2200.	
" boilers, water, spars, &c., &c.,		
" hull,	2040.	

BOILERS.—Eight—Vertical Tubular.

Length of boilers, two 17 feet, and six	20 feet.	3 inches.
Breadth " each,	13 "	
Height " exclusive of steam chimney,	11 "	
Number of furnaces, 48.		
Breadth of furnaces,	2 "	9 "
Length of grate bars,	7 "	6 "
Number of tubes, 13,504.		
External diameter of tubes,		2 "
Length of tubes,	3 "	2 "
Diameter of smoke pipes, each	8 feet.	
Height " " above deck,	48 "	
Description of coal, Anthracite or Bituminous.		
Draft, Natural.		

PADDLE WHEELS.—

Diameter,	40 feet.	
Length of blades,	12 "	
Depth "		24 inches.
Number " 32.		

C. H. H.

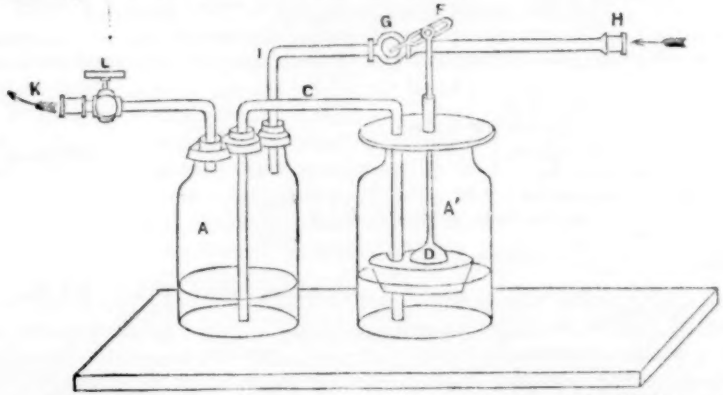
*Markus's Apparatus for Regulating the Pressure of Gas used in Chemical Laboratories.** By FERDINAND F. MAYER.

The application of gas in laboratories, which besides its comparative cheapness offers advantages not attainable by any other fuel, is, however, combined with some trouble when a certain temperature is required to be kept up for a greater length of time. This obstacle is caused by the different amount of pressure on the gasometers at various hours of the day and night, it being considerably lighter during the former than during the latter period.

The following table shows these variations as observed during a few days in May last, by Prof. E. Hornig in Vienna:

Date.	Hour.	Pressure in inch. Water.	Date.	Hour.	Pressure. in inch Water.	Date.	Hour.	Pressure in inch. Water.	Date.	Hour.	Pressure in inch. Water.
May 4,	10 A. M.	½	May 5,	1½ P. M.	⅝	May 5,	6 P. M.	1⅛	May 6,	NOON.	½
"	1½ P. M.	½	"	3½ "	⅜	"	6½ "	1¼	"	1½ P. M.	⅜
"	5¼ "	⅝	"	4¼ "	1	"	6½ "	2	" 7,	8 A. M.	¼
"	6 "	3	"	4½ "	½	" 6,	9 A. M.	½	"	11 "	¼
"	6½ "	2	"	5½ "	1½	"	9½ "	⅜	"	1½ P. M.	⅜
" 5,	NOON.	½	"	5½ P. M.	1	"	9½ A. M.	½	"	5 "	¼

To counteract this irregularity, Mr. S. Markus, the machinist of the Imperial Institute, on the suggestion of Prof. v. Hauer, contrived a very simple apparatus which, at least, for temperatures not exceeding 100° C., (212° F.) has been found to work admirably.



A and A′ in the annexed cuts, represent two glass vessels filled to one-third with water, and partially sunk into the board or plate upon which they are placed. A is a common Wolfe's flask with three corks fitting air-tight, each holding a glass tube. A′ is a wide mouthed jar covered with a plate of metal, which is secured to the neck by a few corks fastened to the lower side, without being air-tight.

The two vessels are connected by the glass tube C, which passes at both ends vertically nearly to the bottom, and by being filled with water, causes the liquid in the two bottles to be of the same level. D is

*From the Journal of the Imperial Geological Institute at Vienna, 1855.

a cork float of conical shape. To its centre is fastened a metallic rod, which at F, connects with a lever having a slitted axis, which allows the rod to retain its vertical position when the lever is being moved upwards and downwards. By these movements, the lever opens or closes the stop-cock G, in the caoutchouc pipe H I, which receives the influx of gas at H. When the lever G F is parallel with H I, the stop-cock G is fully opened.

The inside bore of the cock is oval and of the same size as that of H I. At K, the apparatus is connected with another caoutchouc pipe; the stop-cock L, or a clamp serving to regulate the efflux of gas at the burner, that is, the size of the flame. The bore of the connexion at K is somewhat smaller than that at H I.

The manner in which this contrivance works is now readily perceived. The gas entering at H, exercises its pressure on the water in A, which causes a proportionate quantity of water to pass through the syphon into A′; with the level of the liquid in A′ the cork-float and with it the rod is raised, simultaneously, the lever G F set in motion, and through all this the influx of gas regulated by its action on the stop-cock G.

It is evident, that the consumption of gas by the burner, and bore of conductors, ought not to be calculated for less than the minimum pressure of the gas in the service-pipe.

The only portion of this apparatus requiring particular nicety in adjusting is the stop-cock G, which turns in a perfectly cylindrical bore, and though of the utmost susceptibility to the action of the crank G F, is perfectly air-tight.

For the Journal of the Franklin Institute.

Tubular Boilers for Western River Steamboats.

Some of the engine builders in Cincinnati and Pittsburgh, are introducing into boats now constructing for service upon the Ohio and Mississippi Rivers, boilers in which the return heat is conveyed through tubes, instead of large flues. This is one of the most important changes that has been made in Western steamboat motive apparatus, since its establishment upon these rivers; and it is one that cannot fail to produce good results, for, in connexion with the annexed resolution of the Inspectors of Steamboats, fixing the pressure of steam in proportion to the thickness and diameter of the shell of the boiler, it must operate to lessen, if not banish, the disastrous consequences of collapse and explosion. As in the East, no doubt but tubular boilers will be found to give every satisfaction to the engineers under whose charge they shall be placed, when the experience of the constructors shall have perfected them in the best manner of securing the tube ends to prevent leakage; and the best proportion of space between contiguous tubes, to secure evaporative efficiency, with facility of access, for removal of scale and mud. In those noted, the tubes are about fourteen feet long, three inches diameter, and one inch apart; which is closer than usual in the practice of many Eastern marine engineers, who have learned, that the steam producing quality of a tubular boiler, does not depend upon the number of the tubes, but upon the proper proportion between their aggregate area and that of the grates.

When the tubes are crowded in, the excess is not only a wasteful expenditure of costly materials, but is hurtful, as the draft is made sluggish by the too great area; the water capacity of the boiler is diminished; and, the upper rows of tubes are liable to become over-heated from being deprived of intimate contact with the water, the spaces being mainly occupied by the passage of the steam bubbles formed upon the lower tubes and the shell. A preventive of the latter defect would be, increasing the spaces between the tubes of the horizontal rows as they approach the surface of the water; say, for example, where the tubes are of three inches diameter, let the spaces of the bottom row be one inch; of the next row, one and one-eighth; next, one and a quarter, and so on increasing by eighths, or any other quantity that may be determined by the number of the rows. This disposition will also afford a better chance for the insertion of the tools required to loosen the scale upon the lower tubes, and for repairs.

* "*Resolved*—That the following Table is hereby adopted, for the guidance of Local Inspectors in the performance of their duties:

DIAMETER OF BOILERS.

Pressure equivalent to the standard pressure for a 42-inch boiler, ¼-inch iron."

Wire gauge.	Thick. of iron.	34 ins. in diameter.	36 ins. in diameter.	38 ins. in diameter.	40 ins. in diameter.	42 ins. in diameter.	44 ins. in diameter.	46 ins. in diameter.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	5/16	169·85	160·41	151·97	144·37	137·50	131·25	125·54
2	14/48	158·52	149·72	141·84	134·75	128·33	122·50	117·17
3	13/48	147·20	139·03	131·76	125·12	119·16	113·75	108·80
4	1/4	135·88	128·33	121·57	115·50	110·00	105·00	100·43
5	11/48	124·55	117·63	111·44	105·87	100·83	96·25	92·06
6	10/48	113·23	106·94	101·31	96·25	91·66	87·50	83·69
7	3/16	101·91	96·24	91·18	86·62	82·50	78·75	75·32

* Copied from a printed card intended for the use of the Inspectors and Engineers of the Western rivers.

W. J.

For the Journal of the Franklin Institute.

The Theory of the Gyroscope. By CHARLES J. ALLEN.

This beautiful and interesting philosophical toy, has excited no little attention of late, and hundreds of them have been sold in this City and elsewhere within the last few weeks. In its present simple form it would seem to be somewhat new, although the *Rotascope* described in this *Journal* by Prof. Walter R. Johnson, in 1831 (vol. viii. 2d Series, p. 361), is, when divested of its outer rings, identical with the Gyroscope of the present day, or at least with the American instrument of that name. The Gyroscopes contrived by Foucault some three or four years since, for the purpose of illustrating the rotation of the earth, are more complicated. But in all these instruments, as well as in that invented by Laplace many years ago, and mentioned in Prof. Johnson's article above referred to, the same principle is illustrated, viz: the inertia of the plane of rotation.

Let us now examine how this principle, in conjunction with gravita-

tion, produces the seemingly paradoxical behaviour of this little instrument;—why it is that if a heavy wheel rapidly rotating on a horizontal or inclined axis, be supported on a point, or by a string, *at one end only* of that axis, the unsupported end will not fall, but the whole instrument will revolve nearly horizontally about the point of support, the axis gradually—at first very gradually—approaching the vertical position.

Let the circle A B D E (Figs. 1 and 2), represent the position of the wheel when the instrument is first placed on the point of support, and the hand is disengaged from it. In fig. 1, we are supposed to see the wheel from a position directly in front, and the point of support (being behind the centre c) is not represented. In fig. 2, we see the wheel nearly edgewise, but partly *in front*; s is the point of support, and s c the axis of rotation. The arrows indicate the direction of the rotation, and the same letters mark corresponding parts in the two figures.

Fig. 1.

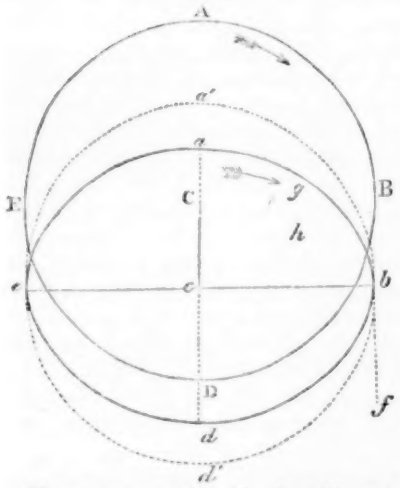
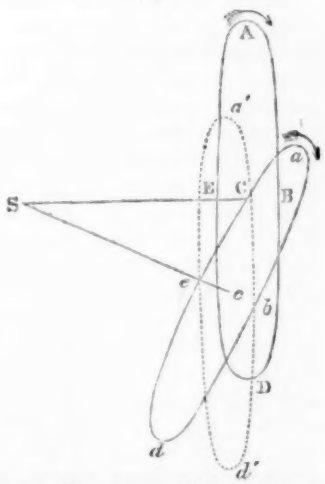


Fig. 2.



Now, suppose the wheel and its attachments, by virtue of their weight, to fall a short distance, the centre c describing about the point of suspension s, the arc c *c*. The wheel has now the position *a b d e*. Let *a' b d' e* be a circle about the centre *c*, and parallel to the original circle A B D E. Then *a' b d' e* represents the position the wheel would have, had it fallen to its new centre *c*, and at the same time retained the parallelism of its plane of rotation. Now, it is a well known principle, and a necessary result of *the inertia of the direction of motion*, that if the position of a rotating body be changed, it will, if not prevented by other forces, preserve the *parallelism* of its plane of rotation. This arises from the refusal of the centrifugal *tangents* of the corresponding parts of the rotating body to change *their direction*. Hence, if the wheel fall, as supposed above, and at the same time be forced to assume the position *a b d e*, it would tend to rotate in the plain *a' b d' e*, and a particle at *b*, would have a centrifugal tendency in the direction of the tangent *b f*, which tangent is not in the plane *b d e*, but *in front* of it in the plane *b d' e*, this tangent representing the original direction of motion in that part

of the plane of the wheel before the wheel had fallen from its first position. This tangential force may be resolved into two forces, viz: a tangential force lying in the plane *b d e*, and a force acting perpendicularly to that plane, the latter tending to draw the particle at *b forwards* out of the plane of the wheel. This result is produced not only at *b*, but on every particle of the wheel to the right of the vertical diameter *a d*; as may be shown by drawing circles parallel to A B D E, through any points *g*, *h*, in *a b d*. The effect is a maximum at *b* (the extremity of the horizontal diameter), and it vanishes along *a d*. In the same way we find that the tendency of every particle in the wheel to the left of *a d*, is to fly off in a tangent *behind* the plane *d e a*. Hence, there is a tendency to curve the *right* hand half *a b d* of the wheel *outwards from* the point s, and to curve the *left* hand half *inwards towards* the point s. The result is a revolution in the direction *b e*, around the point s.

Having thus established a horizontal orbitual revolution of the wheel about the point s, let us next consider the effect on the wheel of *this* motion in connexion with its rotation. By precisely the same train of reasoning as above, we will find that as a movement of the wheel in the direction c *c*, about the point s, produced a curving tendency *outwards* of the *right*-hand half, and a curving tendency *inwards* of the *left*-hand half, so a movement in the direction *c e*, will produce a curving tendency *inwards* of the *upper* half *e a b*, and a curving tendency *outwards* of the *lower* half *b d e*. Now, the effect of this is to *tend* to *raise* the wheel and its attachments, and produce a revolution about s, in the direction c c. But this *tendency* upwards is opposed by gravitation—the weight of the wheel &c.,—and it does not *overcome* this opposing force, it does not quite equal it; it may be made to approach nearer and nearer to it by increasing the velocity of rotation of the wheel. Were it possible to increase this velocity until it reached that *unlimited limit* called by mathematicians *infinity*, the little instrument would stand out stiff and unmoved, without revolution about the point of suspension, and without falling the least distance from its place.

We see from the foregoing that the tendency of the instrument to fall describing a *curve* about the point of suspension, produces an orbitual revolution about this point; and that this revolution produces an upward tendency which partly balances gravity, but gravitation has sufficient ascendency to produce a continual, though very gradual, descent; which descent maintains the orbitual revolution.

The theory of the Gyroscope indicated in this hastily prepared article, is offered by the writer as accounting for its singular movements. It is believed to be consistent with itself, and with the varied experiments he has yet seen tried with this interesting instrument. Not having met with any other explanations of the subject, he does not know how they may correspond with the above.

There are several interesting points that should have been treated of in this article, more particularly the result of the conflict of the curving tendencies from the downward and the horizontal motions: but want of leisure, and the necessarily restricted limits of this communication, prevent the writer from enlarging more at this time. He may possibly resume the subject in a future number of the *Journal*.

Philadelphia, 5th Month 19th, 1856.

*On the Commercial Economy of Working Steam Expansively in Marine Engines.** By Mr. Edward E. Allen, of London.

(Continued from page 338.)

In the paper read at the last meeting, the author endeavored to trace out the effects which would result from working steam more expansively than is usual in marine engines. These effects were considered with respect to the increased weight of the engines, and space occupied by them, and the increased capital required; and also with respcet to the saving in weight and cost of coals, and increase of cargo-space occasioned by a less quantity of coals being used for any given voyage.

The various calculations were based on the supposition that the usual practice is to cut off the steam at $\frac{3}{4}$ths of the stroke; and the cylinders were supposed to be increased in capacity to $1\frac{1}{2}$, 2, $2\frac{1}{2}$, and 3 times successively, in order to effect greater expansion.

By doubling the capacity of the cylinders, it would be found that the steam must be cut off at about $\frac{1}{4}$th of the stroke; and by increasing them to three times, it must be cut off at about $\frac{1}{7}$th of the stroke, in order that the actual power developed may in all cases be the same, and the economy would arise simply from the steam being more expanded in the larger cylinders proposed to be substituted for those ordinarily in use. The pressure of the steam was supposed the same in each case; and the quantity of coal, presumed to be used by marine engines, was based on the supposition that steam of about 20 lbs. pressure per square inch above the atmosphere was employed.

In accordance with the wish expressed at the last meeting, the author now proposes to consider the question of economy arising under different circumstances, namely, an increase in the pressure of the steam employed. There are several ways in which economy may be obtained:—1st, by working steam of the ordinary pressure more expansively than usual; this being the mode of economizing pointed out in the paper read at the last meeting: 2d, by using steam of a higher pressure and expanding to the same extent, or in the same degree, as is now usually the case, namely, about $1\frac{1}{3}$ time, or cutting off at $\frac{3}{4}$ths of the stroke: and 3d, by using steam of a higher pressure, and allowing it to expand much more than is now usually the case, or down to, say, 5 lbs. per square inch above a vacuum as a practical limit.

Thus economy would arise simply from using steam of a higher pressure, but still greater economy would result from allowing such high pressure steam to expand fully. To render this matter clear, it will be necessary to refer to a Table given in the paper read at the last meeting:—

Spaces occupied by steam,	1	2	3	4	5	6	7	8	9	10
Power developed,	1	1·7	2·1	2·4	2·6	2·8	3·0	3·1	3·2	3·3

The quantity of steam being the same in all cases, but allowed to expand so as to occupy the increased spaces.

In this Table no allowance is made either for back-pressure, or for a reduction of power owing to a reduction of temperature while expand-

* From the London Artizan, Feb., 1856.

ing, which, if taken into account, would rather reduce the amounts given. With this exception, however, the ratios of power gained by expansion, as shown in the Table, may be considered as correct for all pressures of steam, or, in other words, the same relative advantage would follow from expanding 1 cubic foot of steam into 3 cubic feet, whether the pressure were 15 lbs. or 120 lbs. on the square inch, the gain from expansion alone being in the ratio of about 2 to 1.

The high-pressure steam would, however, be more economical than the low-pressure, as will be seen from the following Table XIX., which gives the power developed, and the volumes of steam at various pressures formed from the same volume of water, and consequently from the combustion of the same quantity of fuel. The fourth column gives the ratios of power developed, when the steam is used *without expansion*, a back-pressure of 2 lbs. being deducted. The fifth column gives the ratios of power developed when the steam is expanded down to 5 lbs. per square inch above a vacuum, and a back-pressure of 2 lbs. deducted; and the sixth column gives the part of the stroke at which the steam must be cut off, so as to expand down to 5 lbs. Column 7 gives the consumption of fuel required to develop the same power, ordinary practice being taken at 100; and column 8 the per centage saving of fuel deduced from column 7. The last column gives the ratios of the capacity of cylinder required in each case to develop the same power, and to allow of expansion down to 5 lbs., the ratios being calculated from the size of the cylinder required for 35 lbs. steam, cut off at $\frac{3}{4}$ths, which is taken as 1.

TABLE XIX.

Table showing the power developed and the volume of steam at different pressures, produced from the same volume of water, and consequently with the same consumption of fuel.

Total pressure (including atmosphere) in lbs. per square inch.	Volume of water.	Volume of steam.	Steam *not* expanded, but back-pressure of 2 lbs. deducted. Ratio of power developed compared with ordinary practice. *	Steam expanded down to 5 lbs pressure, and back-pressure of 2 lbs. deducted.			
				Ratio of power developed, * compared with ordinary practice.	Part of stroke at which steam must be cut off to expand to 5 lbs.	Consumption of fuel for the same power, in per centage of ordinary consumption	Per centage saving of fuel for the same power.	*Capacity of cylinder required for the same power.
						Per cent.	Per cent.	
15	1	1669	·66	1·24	1-2·7th	80	20	$31\frac{1}{2}$
20	1	1281	·71	1·46	1-3·5	68	32	$3\frac{1}{2}$
25	1	1044	·74	1·64	1-4·3	61	39	$28\frac{1}{2}$
30	1	883	·76	1·78	1-5	56	44	$25\frac{3}{4}$
35	1	767	·78	1·91	1-6	52	48	$23\frac{3}{4}$
40	1	679	·80	2·02	1-6·6	49	51	$21\frac{1}{2}$
50	1	554	·82	2·22	1-8	45	55	$2\frac{1}{4}$
60	1	470	·83	2·37	1-10	42	58	$17\frac{1}{2}$
70	1	400	·84	2·50	1-11	40	60	$15\frac{1}{2}$
80	1	353	·85	2·62	1-12·6	38	62	$13\frac{3}{4}$
90	1	316	·86	2·66	1-14	37	63	$13\frac{1}{2}$
100	1	287	·87	2·83	1-15·6	35	65	$13\frac{1}{2}$
110	1	266	·89	2·91	1-17	34	66	$11\frac{1}{2}$
120	1	250	·92	3·00	1-18	33	67	$11\frac{1}{2}$

* Ordinary practice is assumed at 35 lbs. total pressure, cut-off at $\frac{3}{4}$ths of the stroke, the power developed being called 1.

** The size or capacity of cylinder in ordinary use, *i. e.*, for 35 lbs., steam cut off at $\frac{3}{4}$ths, is taken as 1.

Allowance is made in this Table for the reduction of pressure arising from a reduction of temperature during expansion, and the difference this makes may be understood by seeing, from the Table, that steam of 120 lbs. pressure, expanded 18 *times* only, reduces the pressure to 5 lbs. per square inch; whereas, if no reduction of pressure took place from a reduction of temperature during expansion, steam of 120 lbs. would have to be expanded 24 *times* (instead of 18 times as above) to reduce it to 5 lbs. pressure.

The Table also shows how the ordinary practice may be improved upon; for example, by using steam of 120 lbs. pressure, and cutting off at $\frac{1}{18}$th of the stroke, in which case 3 times the power will be developed from the same combustion of fuel.

As the final pressure is here supposed to be 5 lbs. in all cases, it follows that the size or capacity of cylinder required is in all cases the same, namely, about 4500 times the bulk of water evaporated. In ordinary practice the capacity of cylinder may be taken at about 1000 times the bulk of water evaporated; so that with 120 lbs. steam, cut off at $\frac{1}{18}$th of the stroke, although 3 times the power is obtained by the same combustion of fuel, yet the capacity of the cylinder must be about $4\frac{1}{2}$ times that required for steam at 35 lbs., and cut off at $\frac{3}{4}$ths. It follows from this, that the *same* power would be developed in a cylinder $1\frac{1}{2}$ times the ordinary size.

In like manner, with steam of 50 lbs. total pressure expanded to 5 lbs. (2 lbs. back-pressure allowed), the steam would require to be cut off at about $\frac{1}{8}$th of the stroke; and in order to develop the same power as in ordinary practice, namely, 35 lbs. cut off at $\frac{3}{4}$ths, the capacity of the cylinder must be just doubled.

The amount of economy obtained by using steam at increased pressures may be found from column 5. For instance, steam at 50 lbs. pressure, cut off at $\frac{1}{8}$th, gives 2·22 times the power obtained in ordinary practice (that is, with 35 lbs. steam, cut off at $\frac{3}{4}$ths); and in like manner, steam of 120 lbs., cut off at $\frac{1}{18}$th, gives 3 times the power; so that the *same* power is obtained by the combustion of 45 and 33 per cent. of the fuel, or, in other words, the saving in these cases is about 55 and 67 per cent. respectively.

In comparing this economy, due to the use of high-pressure steam, with that shown in the former paper to result from the greater expansion alone of steam of 35 lbs. total pressure, the difference is very marked; for in the latter case, increasing the size of cylinder to $1\frac{1}{2}$ times, the economy was only 19 per cent.; whereas, with the same increase in size of cylinder, and 120 lbs. of steam, the saving is 67 per cent., or $3\frac{1}{2}$ times as great. Again, doubling the size of cylinder with 35 lbs. steam, the saving was 29 per cent.; whereas, with double the size of cylinder, and 50 lbs. steam, the saving is 55 per cent., or nearly double.

It would occupy too much space to pursue the investigation so far as to exhibit at full length the economy resulting from employing steam of *increased pressure* in cylinders of the *increased sizes* assumed in the previous paper; but the cases may be considered in which the size or nominal H. P. of the engines is increased to 1, 2, and 3 times, the intermediate sizes being omitted.

The comparative results are given in the following :—

TABLE XX.

Table showing the relative economy of obtaining the same power by using steam of increased pressure, and by increasing the size or nominal H. P. *of the engines from* 1 *to* 2 *and* 3 *times (the intermediate sizes being omitted.) Back-pressure allowed of* 3½ *lbs.*

Total pressure of steam in lbs. per square inch.	Ratio of size of nominal H. P. of engines.								
	1			2			3		
	Cut off at	Final pressure in lbs. per sq. inch.	Ratio of coal consumed.	Cut off at	Final pressure in lbs. per sq. inch.	Ratio of coal consumed.	Cut off at	Final pressure in lbs. per sq. inch.	Ratio of coal consumed.
35	3-4th	25¼	100	1-4th	7¼	66	1-7th	4¼	57
40	2-5	14½	68	1-6	5¾	57	1-10	3½	51
50	1-3·3	13½	58	1-8	5	48	1-13	3	45
60	1-4	13	53	1-9·5	4⅞	45	1-15	3	42
70	1-5	12	48	1-12	4¾	41	1-18	3	39
80	1-6·6	10	43	1-15	4⅛	38	..	..	..
90	1-8	9¼	40	1-18	4	36	..	..	..
100	1-10	8¼	38	1-22	3⅝	35	..	..	..
110	1-11	8	37	1-24	3½	34	..	..	..
120	1-12	7¾	35	1-26	3½	32	..	..	..

From this Table it appears that a choice may be frequently made between two ways of employing steam, both resulting in the same economy, so far as the consumption of coal is concerned. For instance, steam at 50 lbs., cut off at $\frac{3}{10}$ths, and steam at 35 lbs., cut off at $\frac{1}{3}$th, give the same results, or nearly so; but the low-pressure steam requires a cylinder of 3 times the capacity of the other.

Again, steam at 70 lbs., cut off at $\frac{1}{5}$th, and steam at 50 lbs., cut off at $\frac{1}{8}$th, give the same results; but the low-pressure steam requires a cylinder of double the capacity of the other.

The results have not been carried out in the third series of columns for pressures above 70 lbs. as the final pressures fall too far below the assumed back-pressure.

The consideration of the subject will now be confined to the economy that would be effected by using steam of *increased pressure* in a cylinder of the *ordinary size*.

The following Table XXI. has been compiled in order to show with what economy steam with increased pressure can be expanded in a cylinder of the ordinary size so as to develop the same power.

The pressures begin at 35 lbs., cut off at $\frac{3}{4}$ths, which is assumed as the ordinary practice, and the power developed under these conditions is called 1. Column 1 gives the total pressures; column 2 the part of the stroke at which the steam must be cut off in each case to develop the same power; column 3 the ratio of the power developed by the same consumption of coal; column 4 the relative quantities of coal required to develop the same power; column 5 the per centage saving of coal; and column 6 the final pressure of the steam on its exit from the cylinder.

From this Table it will be seen that in the case of an engine working with 35 lbs. steam and cutting off at $\frac{3}{4}$ths of the stroke, if it be required to increase the pressure (in order to economize) to say 70 lbs., then the

steam must be cut off at about $\frac{1}{5}$th of the stroke, and the consumption of coal will be only 48 per cent. of the quantity previously consumed, the power developed remaining the same. So, also, if the pressure be increased to 120 lbs., the steam must be cut off at about $\frac{1}{12}$th of the stroke and the consumption will be reduced to 35 per cent., the same power being developed. The size of the cylinder remains the same in all cases.

With respect to the weight of machinery, it will not make much difference to what pressure the steam is raised; for although the weights slightly decrease when high-pressure steam is used, yet the difference is very little, and not worth considering in the present investigation.

TABLE XXI.

Table showing the economy of working steam of increased pressure in a cylinder of the ordinary size.

Total pressure of steam in lbs. per square inch.	Part of stroke at which steam is cut off to develop same power.	Ratio of power developed by same consumption of coal.	Ratio of coal required to develop same power.	Saving of coal in per centage on ordinary consumption.	Final pressure of steam on leaving cylinder in lbs. per square inch.
				Per Cent.	
35	3-4th	1·00	100	—	25½
40	2-5	1·47	68	32	14½
50	1-3·3	1·72	58	42	13½
60	1-4	1·88	53	47	13
70	1-5	2·06	48	52	12
80	1-6·6	2 28	43	57	10
90	1-8	2·44	40	60	9¼
100	1-10	2·60	38	62	8¼
110	1-11	2·70	37	63	8
120	1-12	2·80	35	65	7¾

(To be Continued.)

Mechanical Engineering as applied to Farm Implements.

By H. HOWSON, Civ. Eng.

(Continued from page 260.)

Machine for cutting Hemp, Corn, Sugar Cane, and Cotton Bushes.

Patent granted to William B. Coates, October 15th, 1850.

This ingenious labor-saving apparatus, represented in the annexed perspective view, consists of two longitudinal beams A, which, with their connecting cross pieces, form the main frame of the machine.

Underneath the back end of the frame, are boxes for receiving the axle, on which are secured the main driving wheels B.

On a pin underneath the cross piece at the front end of the frame, swivels a block, to the ends of which, are hung the wheels *e*, *e*, and to this block is secured the pole, by which the whole apparatus is drawn and guided over the ground.

At right angles to the framework, and near the middle of the same, projects the out-rigger or bracket C, and to the latter are secured the two guide teeth or fingers W and P, the latter being permanent, and the former

adjustable, so that the space between the two may be increased or diminished at pleasure.

The finger P, has on the inside a cutting edge, arranged to coincide with the cutting edge of the knife or chopper *n*, when the latter is brought down by the action described hereafter.

The chopper *n*, is permanently secured to the shaft N, which has its bearing at one end in the box O, at the end of the out-rigger C, and at the opposite end in a box, secured to a continuation of the out-rigger between the beams A, A, of the main frame.

The end of the shaft N, which fits into the latter box, has a portion of a screw cut on its surface, which is adapted to a similar portion of a screw in the box, so that when a reciprocating motion is communicated to the shaft N, it at the time receives a lateral reciprocating motion.

H is a crank attached to a shaft, which has its bearings on the underside of the opposite beams A of the frame, and this shaft is so connected by a system of gear wheels to the axle of the driving wheels B, as to receive a rapid motion when the machine is drawn over the ground

To the end of the crank H is connected, by means of a universal joint, the rod J, the opposite end of which is jointed to a crank M on the shaft N. From the back of the out-rigger C projects two bars, to the ends of which are attached the rods X, X, the latter are bent and pass over the out-rigger to the front of which they are connected, one on each side of the fingers W and P.

Underneath the bars which project from the back of the out-rigger, are staples for receiving the rod R, which is connected to a horizontal lever under the out-rigger, the lever being connected by means of a rod

to the vertical lever *u*; a spiral spring *t*, being so connected with the horizontal lever, as to maintain the rod R, in its position across the two projecting bars when not removed by operating the lever *u*. Another lever *f* is so arranged in connexion with the gearing, for actuating the shaft N, that the motion of the latter may be instantly stopped.

Both levers *n* and *f* are so situated as to be within reach of the driver, who sits on the platform *s*.

The machine is drawn over the ground, and so directed that the stalks to be cut shall pass into the space between the two fingers W and P, where they are submitted to the action of the chopper *n*, which has a rapid movement imparted to it, by the system of gearing above alluded to.

The screwed end of the shaft N, directs the chopper as it descends in an oblique direction, thus effectually cutting the stalks that have passed between the fingers W and P.

The upper portion of the stalks or bushes thus cut, fall over the out-rigger on to the rod R, and when a sufficient number have been collected on the latter, the driver, by means of the lever *u*, withdraws the rod, and allows the bundle of cut stalks to drop on to the ground.

The above described arrangement of one chopper answers well for cutting corn, sugar cane, and cotton stalks. When the machine is used for cutting hemp, however, or any broad cast crops, several straight teeth cast in one piece, will be required to slide on the out-rigger C, and several choppers to suit. The inventor is at present engaged in simplifying and perfecting his apparatus, so as to reduce the cost and render it a serviceable and economical farm implement.

During the last five or six years, considerable attention has been paid to improvements upon windmills, and a variety of plans, all more or less efficient, have been suggested and carried out for the purpose of rendering them serviceable for farm purposes.

As a specimen of a recently invented and constructed windmill and one in the design of which no little ingenuity is exhibited,

Halladay's Patent is here selected for Illustration.

Figure 1 is a perspective view, and figure 2 is a face view of the wing or sail ring, and parts of the governor.

The nature of the invention consists in having the wings or sails attached to movable or rotating spindles having levers or equivalent devices connected to them, said levers being also connected to a head with wings rotating on the same shaft. The head has a lever connected to it, which is operated by a governor that slides the head upon the shaft, and causes the levers or their equivalents, to turn the wings or sails, so as to present a proper resisting surface to the wind, and thereby produce a uniform velocity of the sails, which are made to have a greater or less obliquity, according to the velocity of the wind.

A represents a horizontal shaft, which works in suitable bearings *a a* upon a cap, or turn-circle B; said cap turns loosely upon friction rollers working in the circular plate or bed piece, which is firmly braced and bolted upon the top of the upright timber.

Fig. 1

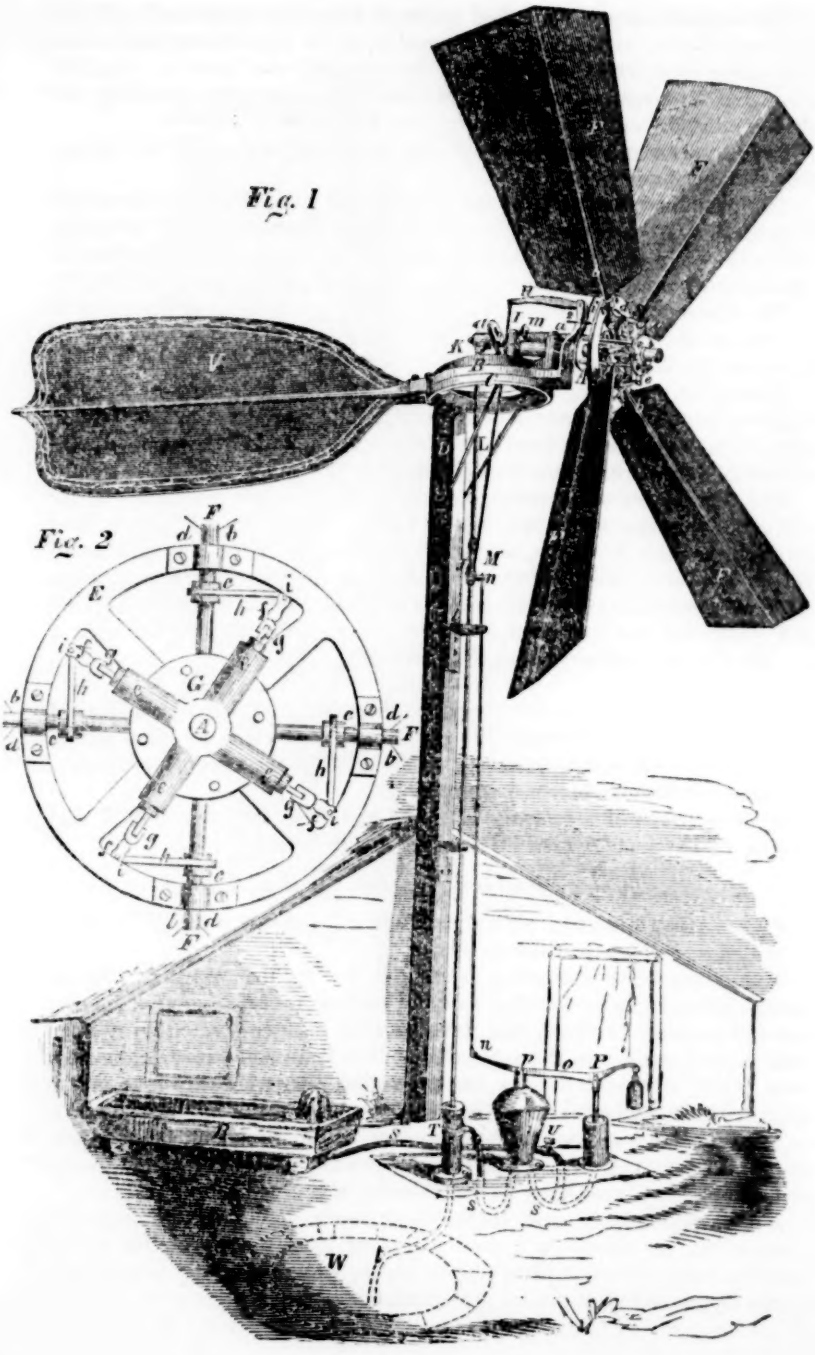


Fig. 2

The shaft A, projects some distance beyond the edge of the cap, or turn-circle, B, and has a wheel E, figure 2, attached permanently to it.

F, represents the wings or sails, which are secured to spindles, *b*, said spindles passing radially through the rim of the wheel, E, and into its hub, the spindles being prevented from withdrawing by collars, which bear against the inner edge of the rim and caps, which are secured by screws over the spindles, the spindles being loose in the wheel E, and allowed to turn upon their axes. Four wings or sails are represented, but any proper number may be used. G, is a hub fitted loosely upon the shaft, A, and having projections *e*, at its front end, to which projections small levers, *f*, are attached by pivots, *g*, the outer ends of the small levers, *f*, being secured to the ends of levers, *h*, by pivots, *i*. The levers, *h*, are secured permanently to the spindles, *b*, as shown in figure 2. The inner end of the slide-head has a groove turned on it, in which groove a forked lever, H, fits, figure 1. The lever H, is bent, and has its fulcrum at *k*, and to the outer end of it, a wire or rod, I, is attached, said wire or rod passing down through a sleave, moving loosely upon a square iron rod, which forms part of the connecting rod; the outside of said sleave forms a bearing, and moves in a guide which is attached to the upright post, (this guide or box in which the bearing of the sleave works, is attached to a piece of plank, and is sent with the mill, the plank guides in which the wood connecting rod works, are made by the joiner who erects the post, &c.); after passing through the sleave, the lower end of the wire or rod is screwed into the boss, which also works upon the square rod mentioned above. This sliding head or boss, M, has a recess or groove in it, which the fork, *n*, fits; this fork is fastened near the centre of a round iron rod, and works in two small cast iron guides, which are fastened to the upright post; the lower end of said rod has a hole drilled in it, in which a rod or wire is fastened, the lower end being secured to the end of lever, O, at *n*, near the pumps. The object of the above described boss or sliding head with fork fitting in the recess, is to allow the mill, and consequently the connecting rod, to turn around, as the wind changes, without disturbing the stationary regulating rod or wire, attached to the end of lever, O, at *n*. The opposite end of lever, O, is attached by a pivot to a piston rod, P, the piston of which works within a cylinder. R, is a reservoir containing water, and S, is a pipe which projects over the top of said reservoir, the opposite end of the pipe communicates with the outside cylinder, reservoir, R, and a pump, T, at their bottoms, as in dotted lines, figure 1. The rod J, it will be seen, is the piston rod of the pump T; U is a cock in the pipe, S. In case the shaft, A, revolves too rapidly, the cock, U, is somewhat turned so as to check the free passage of water through the pipe, S, and the water will then be forced against the under side of the piston of the outside cylinder, and will raise it, and the head or boss, M, will consequently be moved down upon the rod, J, and the wire or rod, I, will draw downward the horizontal arm of the lever, H, while the vertical arm will force outward the head, G, on the shaft, A, and the levers, *f h*, will turn the spindles, *b*, and the wings or sails, F, move obliquely to the wind, and the motion of the mill will be decreased in a corresponding degree. When it is desired to increase the motion of the mill, the cock, U, is

opened, and the water having a free passage through the pipe, S, the head or boss, M, is raised upon the rod, J, and the head, G, on the shaft, A, brought back to its original position, by the weight upon lever, X, the wings or sails presenting a greater surface to the wind.

In figure 1, the pump is represented as drawing water through the suction pipe, *t*, from a well, W, and forcing it through the air chamber into the reservoir. A crank being on the shaft, A, on the horizontal revolving head, and the rod, I, connected to this crank, a reciprocating motion is given to the piston of the pump, thus drawing and forcing out the water by single stroke alternately. With one valve opening inwards, and one outwards in the bed plate of the pump cylinder, it can work as a single-acting force pump, driving the water through the air chamber into the reservoir without any other connexions of apparatus.

V is a vane attached to a cap or turn-circle, for the purpose of keeping the wings or sails, F, facing the wind.

X is a straight lever, working upon a standard which is held to its place by one of the bolts which secure the cap on the inner bearing to the main shaft. In one end of this lever, is made a slot, which works on a pin, which will be found fastened into the bent lever, H, upon the other end is a sliding iron weight, which keeps the sails spread to the wind.

Instead of discharging the water through branch pipe near *s*, in figure 1, the top of the copper cylinder is covered, and the piston rod works through a stuffing box, the water passes through the copper cylinder and is discharged through a side pipe near the top of the cylinder. The piston rod works inside of a long brass ferrule or pipe, at the upper end of which is a handle or lever. At the lower end is attached a round brass plate, just filling the copper cylinder, designed to move or slide around upon the upper side of the plate or piston, which is attached to the lower end of the piston rod; holes are made through these plates, and when moved upon each other, they operate like a range, opening and closing the water passages through them. If the range is perfectly closed, it will be readily perceived, the whole power of the pump forces the water against the under side of the piston, thus raising the lever O, and drawing down the regulating wire or rod, which will change the obliquity of the sails, till only their thin edge is presented to the wind.—It will be perceived when the principle of the regulator, which is represented in the cut, is thoroughly understood, that when a very high column of water is to be forced up and this regulator used, a heavy weight must be attached to the lever, sufficient to balance the column of water, and hold down said lever, while the mill and pump are at rest, or doing their appropriate work. But in using the water regulator, not represented in the cut which we have described, a small weight only is used, just sufficient to overcome the friction in the stuffing box, and cause the lever to drop, the weight being the same in all cases. The turning the stop-cock accomplishes the same object in the one case, as the turning the range does in the other.

Mills on the above plan, are manufactured to a considerable extent, by the Halladay Windmill Company, South Coventry, Connecticut.

(To be Continued.)

Translated for the Journal of the Franklin Institute.

Note on the Latent Heat of Vapors: By M. LEGRAND, Professsor of Astronomy in the Faculty of Sciences, of Montpelier.

(Read before the Academy of Sciences of Paris, 4th February, 1856.)

We calculate the latent heat of vapors erroneously, because we do not take into consideration their specific heat, and we are thus prevented from seeing the very simple law which appears to govern it. In fact, we imagine, frequently, without saying so, that the vapor condenses at the temperature at which it enters the worm; and we establish the formula, as if from that moment it possesses the same quantity of heat as an equal amount of liquid at the same temperature. But we should bear in mind that at the moment it changes its state, it suddenly changes its specific heat, and takes a higher one. By operating as if it was a liquid at the same temperature, we attribute to it more free heat than it has in the state of vapor, and we take this excess from the latent heat, which is consequently found too low.

It appears to me that we ought to proceed as follows: Let t, m, c, be the temperature, weight, and specific heat of the saturated vapor; t', m', c' the initial temperature, weight, and specific heat of the liquid employed for the condensation (the worm included); t'' the final temperature of this liquid, and x the latent heat of the unit of weight of the vapor. The liquid, after condensation, has the mass $m+m'$, and its quantity of heat above 0° (Cent.,) is $(m+m')\ c'\ t''$. It is composed of what it was at first $m'\ c'\ t'$, plus the free heat $m\ c\ t$, of the vapor above 0°, plus the latent heat $m\ x$; we have, therefore,

$$m\ c\ t + m\ x + m'\ c'\ t' = (m+m')\ c'\ t''$$

$$x = \frac{m'\ c'}{m}\ (t''-t') - c\ t + c'\ t'', \text{ for the latent heat of the}$$

unit of weight, and $x + c\ t$ or $\mathrm{x} = \frac{m'\ c'}{m}(t''-t') + c'\ t''$, for the total heat.

By the common reasoning we should have the latent heat $= y = \frac{m'\ c'}{m}$ $(t''-t') - c'\ t + c'\ t''$, and for the total heat $= Y = y + c'\ t = \frac{m'\ c'}{m}$ $(t''-t') + c'\ t''$.

For the total heat, the formulæ coincide; they differ for the latent heat; but it is precisely this latter which appears to follow a very simple law. It will be seen that I suppose the condensing liquid as of the same nature with that condensed. It will also be seen that I count the temperature of the vapor from 0°: it would not be difficult to modify the formulæ so as to count from any other temperature, but 0° appears to merit the preference, at least for the vapor of water, what I have chiefly in view.

To apply the formula of latent heat to the vapor of water, I cannot do better than to borrow the formula resulting from M. Regnault's experiments. Calling t the temperature of the vapor, and l the total heat for

the unit of weight, he found that from 0° to 230° (Cent.,) the experiments accord in the most satisfactory manner with the formula.

$$l = 606{\cdot}5 + 0{\cdot}305\ t, \text{ or } l = 0{\cdot}305\ (1988{\cdot}5 + t).$$

To deduce the latent heat from this, we must subtract $c\,t$ from l. But c in this place can be neither the specific heat under constant pressure, nor under constant volume, for they cannot be taken without passing the vapor into the state of gas, or in part into the liquid state. For vapors saturating space, which are neither gas nor liquid, there is no other specific heat than that defined by M. Regnault; that is, the quantity of heat which it is necessary to give to 1 kilogramme of saturated vapor, to elevate its temperature 1°, while at the same time this vapor is compressed so as to maintain the state of saturation; in other words, it is $\frac{dl}{dt}$ or 0·305. But if from l we subtract $0{\cdot}305\ t$ there remains 606·5; that is to say, *the latent heat, calculated as I have explained it, is constant.* In terms, this is Southern's law; in fact it is materially different. Understood as I have explained it, it appears to me that it must be admitted as a legitimate deduction from M. Regnault's experiments.

Translated for the Journal of the Franklin Institute.

Description of a New Interference Apparatus, and some of its Uses.

By M. J. Jamin.

M. de Senarmont presented to the Academy of Sciences of Paris, at their Session of 10th March, a note of M. Jamin, describing a new piece of optical apparatus.

The construction of apparatus for exhibiting and establishing the smallest difference in the velocity of two luminous rays, which had passed through equal thicknesses of unequally refracting media, has long been proposed. M. Soleil Duboscq constructed for Arago an instrument of this kind, which fulfilled the purpose for which it was constructed, but allowed serious inconveniences to remain. The slight separation of the interfering rays, the excessive narrowness of the fringes obtained, their continued agitation, and above all, the difficulty in adjusting the various parts of the apparatus, have heretofore prevented its employment, restricted its applications, and diminished its sensitiveness. But, were it possible to give to the rays a greater separation, to increase at will the breadth of the fringes and make them immovable, and to simplify the manipulation of the parts, we should have an instrument capable of rendering great service to physical science.

M. Jamin thinks that he has completely resolved this problem, by utilizing the phenomenon of colored rings produced by thick plates. He places, parallel to each other, two pieces of very pure and thick glass, and reflects the light upon the first, which gives two beams, the one reflected from the first, the other from the second surface of the glass; these are the interfering beams, and they will have a separation proportioned to the thickness of the glass. These two beams, meeting the second glass, are again decomposed each into two, as the primitive ray

was by the first glass, and among these four rays thus obtained, there are two which are parallel in direction, equal in intensity and have traversed the same thicknesses of air and glass, and thus give interference fringes. These fringes are broad, luminous and perfectly steady: they may be directed either horizontally, vertically, or obliquely, and what is valuable, they may be so dilated as to give flat tints. In this arrangement there are required, neither a perfectly adjusted narrow slit, nor carefully regulated mirrors, nor lens to view the fringes; the apparatus is reduced to two glasses illuminated by a lamp, and the fringes are seen by the naked eye, spreading themselves out in the image of the glass like the colored rings in the double lens of Newton.

If an opaque body is now placed near to the path of the light, one of the rays may graze its surface, while the other passes at a distance, and if any physical modification is taking place in contact with this body, it is indicated by a deformation of the fringes at the edge of the shadow of the body.

In his note, M. Jamin then describes some applications of his apparatus. When a metal is plunged into water or a saline solution, it is, if oxidizable, always attacked and the fringes deformed. When an electric current is passed through a conducting solution, the chemical decomposition alters the density of the liquid in contact with the electrodes, and the optical phenomenon is changed. By these means we may follow all the chemical phenomena due to the passage of an electrical current.

If the poles of a powerful electro-magnet are placed in a solution of sulphate of iron, the solution is modified, the salt of iron is attracted by the magnet, and the water repelled; the action progressively increases, and the salt of iron finally crystallizes on the poles.

Finally, if a crystal of alum be plunged into a saturated solution of the same salt, the crystal grows by successive additions of the salt, and it may be seen that it attracts the particles of salt from a distance, and consequently augments the density of the solution in its own vicinity, but in actual contact, the index of refraction diminishes, either because the molecules of alum are precipitated upon the salt, and weaken the solution, or in consequence of the disengagement of heat by the crystallization.

---

*Indestructible Printing on Metallic Plates.** By Dr. J. Lotsky.

Messrs. Adams and Gee, printers, of London, have found that metallic plates, of the thickness of ordinary sheet tin, may be printed upon with the usual printing type, if the plates be first coated with a whitish composition—the secret of the inventors. If sheets thus printed upon be afterwards subjected to a certain japanning process, an even lustrous surface is produced, which cannot be acted upon except by a sharp steel instrument. The cost of preparing the printed sheets is small.

It requires no great consideration in order to discover that this invention is of a very important character. In the first place, it is evident, that printed metallic sheets of the above description may be substituted with

* From the Lond. Mech. Mag., Nov., 1855.

great advantage for the mounted paper lessons employed for class teaching in schools, which, from the rapidity with which they become worn, are costly apparatus in all public educational establishments. Moreover, as these durable printed sheets may be prepared very economically, the number of class lessons employed may be greatly increased; and, further, these plates may also be used for maps, diagrams, tables, &c.

In the second place, I venture to suggest that important moral effects might be produced in every country by the circulation of such plates bearing extracts from the highest class of literature, and even well selected quotations from the Bible itself. I am aware that maxims and precepts printed upon paper are already in extensive circulation; but, from the destructible nature of the fabric on which they are impressed, I believe they do not assume that importance which would be attached to them were they produced upon a lasting material, and in an artistic style. The lessons which might thus be perpetuated, and kept continually before the mind of youths in particular, might well be expected to counteract some of the evil effects of modern worthless and injurious paper literature, which, from its ephemeral character, has a natural tendency to degenerate.

Again, printed metallic plates of the kind under notice will certainly be substituted, and that with great advantage, for out-door notices, advertisements, &c. Much difficulty is at present experienced, and much trouble occasioned, from the fact that information of great interest and importance to the public is inaccessible, in consequence of the want of a method of so publishing such information that the expense of frequent renewal (which in the case of long printed statements would be very great) shall not be incurred. The invention under consideration supplies such a method. Other applications of the invention will suggest themselves to the reader. For my own part, I believe it capable of such applications as, if mentioned here, would probably be considered extravagant.

15, *Gower Street North.*

---

*Moulding Slag Bricks and Coping Stones.**

A communication on the question of slag bricks has been made to the *Society of Arts Journal*, by Mr. Hyde Clarke. He says:—In the South Wales districts the copper works supply slag bricks and coping stones to some extent, the smelters receiving a small fee for moulding. Some of the slag bricks are used even in the copper works. This is the case likewise in the works of the Mexican and South American Smelting Company, at Herradura, Caldera, and Tongoy, in Chili, where the walls of the ore-yards, and even the ash-pits and foundations of some of the furnaces are made of these materials. Rough slag is turned to account in making embankments near some of the Welsh and Lancashire Works, but is very porous. The moles at Herradura and Caldera are filled in with rough slag, and parts of the Tongoy and Herradura works are built on what was lately shore, but now land reclaimed from the Pacific by being covered with slag. One objection to slag bricks, which are otherwise cheap, is their brittleness.

* From the Lond. Civ. Eng. and Arch. Jour., Jan., 1856.

For the Journal of the Franklin Institute.

Particulars of the Iron Steamer Jefferson Davis.

Hull and Machinery built by Merrick & Sons, Philadelphia. Intended service, Surveying the Lakes by the Bureau Topographical Engineers, United States War Department.

HULL.—

Length on deck,	138 "	
Breadth of beam at midship section,	21 "	6 inches.
Depth of hold,	8 "	9 "
Length of engine and boiler space,	36 "	
Breadth " "	10 "	6 "
Shaft, forward of stern post, at deep load line,	50 "	6 "
Draft of water at deep load line,	6 "	
" " below pressure and revolutions,	5 "	11 "

With 100 tons of coal and stores.

Tonnage, custom house,	250.
Area of immersed section at deep load draft,	120 sq. feet.
Contents of bunkers in tons of coal,	110.

Masts and rig—One mast, with jib, spencer, and square sail.

ENGINE—One vertical steeple—condensing.

Diameter of cylinder,		50 inches.
Length of stroke,	4 feet.	
Maximum pressure of steam in pounds,	25.	
Cut-off, Allen & Wells' variable.		
Maximum revolutions per minute,	25.	

BOILER.—One horizontal return tubular.

Length of boiler,	13 feet.	
Breadth "	10 "	
Height " inclusive of steam drum,	15 "	6 inches.
" " exclusive " "	10 "	6 "
Weight "	34,000 *pounds.*	
Number of furnaces,	four.	
Breadth of furnaces,	each	$23\frac{3}{4}$ "
Length of grate bars,	7 "	3 "
Number of flues or tubes,	172.	
Internal diameter of flues or tubes,		3 "
Length of flues or tubes,	8 "	6 "
Heating surface,	1496 sq. feet.	
Diameter of smoke pipe,	3 feet.	6 "
Height " above steam drum,	25 "	6 "
Description of coal,	Anthracite.	
Draft,	Natural.	
Consumption of coal per hour,	560 pounds.	

PADDLE WHEELS.—Iron radial—overhung.

Diameter over paddles,	19 feet	4 inches.
Length of "	5 "	3 "
Depth "	1 foot.	6 "
Number " 20.		
Dip of wheels at load draft,	3 "	

Average revolutions per minute at above draft, 22, with 22 inches steam, cutting off at 20 inches of stroke.

Remarks.—Hull of iron; bottom plates $\frac{5}{16}$; sides $\frac{1}{4}$; garboards double riveted to keel, which is $6 \times 1\frac{1}{2}$, solid with stem and sternpost; shell single riveted; clincher built; frames two feet apart, of T iron $3 \times 3\frac{1}{2}$; main deck beams $4\frac{1}{2} \times 4$ T iron, of cabin and forecastle decks $3\frac{1}{2} \times 3\frac{1}{2}$. There are two water-tight bulkheads, one forward, and one abaft the coal

bunks extending alongside the machinery. Has a sunken or trunk cabin aft, having its top flush with rail, and of two inch pine. Main deck of three inch pine. There are three yellow pine keelsons 12×14 extending the whole length of the floor, and firmly secured to the frames. Has a deck house, and above it, forward, a pilot house with steering apparatus. The waterway, outer streak, plank shear, waist and rail, are of wood. Her guards are built light, being required simply to protect the wheels, and are braced by iron knees and tie-bolts with king-posts. They may be removed so that the vessel can pass the canal between the Lakes. This steamship was built in Philadelphia, and left on the 26th May, under steam for Buffalo on Lake Erie, via the St. Lawrence and Welland Canal. J. V. M.

---

*Leaden Pipes in the Supply of Water and Beer.**

Having noticed your important article in last Saturday's *Builder*, relative to "leaden pipes in the supply of water and beer," we think it proper to call your attention to the fact, that a patent was taken out on the 19th of April, 1853, by Mr. John Chatterton, a talented engineer of Birmingham, for coating gutta-percha tubing with lead. This combination of gutta-percha and lead secures remarkable strength, and at the same time avoids the danger arising from the use of the ordinary leaden pipes. We have much pleasure in handing you a specimen of tubing (made under Mr. Chatterton's patent), which has been subjected to the extraordinary pressure of 600 lbs. on the square inch, without exhibiting any symptoms of giving way.

THE GUTTA-PERCHA CO.

*** The specimen referred to appears to be well adapted to the purpose in view. The gutta-percha tube enclosed in the leaden one, though not attached to its interior, is perfectly protected by it, and the inner tube is of considerable thickness.

---

*The Photo-galvanographic Process of Engraving.**

In the hands of Mr. Paul Pretsch, lately the manager of the Imperial Austrian Printing Office at Vienna—the productions of which workshop were so greatly admired in our Exhibition of 1851—light and electricity have at last been most effectively combined, and trained to perform the united functions of the artist, draftsman, and engraver. Drawing by light, and engraving by electricity, are, in themselves, far from new. Every town now possesses its photographers, who enjoy the means of indelibly reproducing not only the outlines, but the nicest lights and shades of both natural and artificial objects, quite independently of the exercise of any purely artistic genius. Similarly, the substantially reproductive power of the electrotypic art, for the purposes of the printer, is a fact of old standing. But the production of printing plates capable of giving us every touch of nature, without necessitating the employment

* From the Lond. Builder, No. 661.

† From the Lon. Prac. Mech. Journal, April, 1856.

either of the pencil of the artist, or the burin of the engraver, is something far advanced beyond even these ingenious scientific applications.

Mr. Paul Pretsch—engaged, as he has been, in the pursuit of science, and improvements in the fine arts, and developing them for the purposes of the printer's multiplying power, under the auspices of a government, which, in this instance, at least, has shown a highly enlightened spirit—was very early impressed with a deep sense of the power conferred upon man by the introduction of photography, and saw clearly enough how much this art was able to assist the real artist in the creations of his own mind, and in multiplying his works. During his photographic trials, he made several experiments upon etching upon metal and stone: but, in adhering to the practice of his predecessors, he got involved in the inconveniences due to the necessity of etching several times for the production of different tints. It was whilst these gropings towards improvement were going on, simultaneously with investigations into photography, that the idea arose as to the possibility of producing, photographically, a printing surface of *relievo* and *intaglio* parts, instead of a mere picture made up of lights and shades. This led to the abandoning of etching or biting in with acid, and the substitution of a new photographic coating adapted for finally obtaining impression surfaces. The results of Mr. Pretsch's labors, as far as they have yet advanced, are now before us. They consist of a set of impressions from plates produced entirely by what the inventor calls "galvanography," the largest size we have seen being 16 inches by 12 inches. The subjects are various, including both architecture and the figure; and, as examples of plates made ready for the printer's hands, without a single touch of the graver, they are far beyond mere curiosities; indeed, they may fairly be classed with good calotypes, or well-finished sepia or indian-ink pictures of the artist, and in beautifully minute accuracy, far outrivaling all that can be produced by the unaided hand of man.

The primary steps of this photo-galvanographic process, are similar to those adapted to the glass-plate photographer. The operator coats a glass plate with a gelatinous solution, suitably prepared with chemical ingredients sensitive to light. This gelatinous matter consists of clear glue, with a strong solution of nitrate of silver, and a weak solution of iodide of potassium. To another portion of the glue solution, there is added a strong solution of bichromate of potass. These two compounds mixed together, form the coating material, which is allowed to dry upon the glass or other plate which is coated with it. When dry, the coated plate is exposed to the light in a copying frame, in contact with the print or drawing which is to be copied; or the camera may be used for a similar purpose. After exposure, the plate exhibits a faint picture on the smooth surface of the sensitive coating, and it is washed either with water, or a solution of borax, or carbonate of soda, when the whole image comes out in relief, whilst the tints of the original are still maintained. When sufficiently developed, this relievo plate is washed with spirits of wine, dried, and treated with copal varnish diluted with oil of turpentine. When dry, the plate is immersed in an astringent solution—as tannin, for example. This treatment, aided by heat, brings out the picture in full relief, ready for being copied for the production of the actual printing

plate. If the matrix plate is prepared for electric conduction, it may itself be placed in the electrotype battery, producing an intaglio copper plate; or, if first moulded, the intaglio mould furnishes the means of obtaining a relievo plate by electro-deposition in a similar way. The stereotype process also affords another means of producing the necessary plate. If an intaglio plate is made, it may be printed from at the common copper-plate printing press; on the other hand, the relievo plate may either serve as the matrix for producing an intaglio printing plate, or it may be itself employed in "surface" printing, like a wood-cut. In the latter case, the narrow impression lines being sufficiently raised, the broad white spaces must be cut out.

By another modification of the process, the gelatinous coating of the image plate is washed with spirits of wine, and then dried, when the picture is produced in intaglio, or sunk. Or, by applying printing ink to the coating, an ink impression may be taken for transference to stone or zinc, to print from in the usual way.

The examples of Mr. Pretsch's productions, to which we have referred, are quite sufficient to show us that the delicate beauty of original photographs need no longer be restricted to the actual picture which the camera gives us; nor need we be driven to the slow process of copying by negative pictures for the production of what are, at the best, but inferior counterparts of the original. The beautiful art of the photographer is thus rendered far more practically and enduringly valuable than it has hitherto been.

The impressions from the photo-galvanographic plates exhibit a tint much superior to mezzotints or aquatints, whilst whatever touches appear in nature are reproduced at the printing press with a fidelity which no artistic labor can rival. We know, too, how very liable photographic originals are to change; and in a series of copies from the same negative, there is always a want of uniformity in the shade of color. With this printing process, however, we are independent of such drawbacks, as the plate impressions are in ink, and the attention of an ordinary printer suffices to keep the pictures to the proper color.

The rapidity with which the plates can be produced, is another important and remarkable feature of the invention. From three days to three weeks, according to the special kind of work in hand, is time enough for the production of finished plates, some of which—as for example, those from photographic originals—the human hand could never engrave; or if imitated by manual engraving, would require even years of unremitting labor. The process, too, affords the means of obtaining exact counterpart plates, so that where extreme expedition is an object, several printing presses may be at work simultaneously, all producing exactly similar impressions. In all cases the artist's original designs are reproduced without the alteration of a single line or touch, and on any scale, so that the cartoons of Raphael at Hampton Court could all be quickly put on printing plates of a size suitable for a pocket volume.

An influential company has been formed in this country for carrying out the objects of the invention on a large commercial scale.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, May 15th, 1856.

John P. Park, President, pro tem., in the chair.

John F. Frazer, Treasurer.

Isaac B. Garrigues, Recording Secretary.

The minutes of the last meeting were read and approved.

Donations to the Library were received from the Geological Society, London; Hon. Job R. Tyson, U. S. Congress; Thomas U. Walter, Esq., Washington City, D. C.; Capt. Wm. H. Emory, U. S. Topographical Engineers; The Kentucky Mechanics' Institute, Louisville, Kentucky; George Bruce, Esq., City of New York; and Prof. Jas. A. Kirkpatrick, Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement of the receipts and payments for the month of April.

The Board of Managers and Standing Committees reported their minutes.

Candidates for membership in the Institute (5) were proposed, and the candidates proposed at the last meeting (3) were duly elected.

Mr. Howson exhibited specimens of sodium, chloride of aluminum, and aluminum, manufactured by Mr. Alfred Monnier, chemist and metallurgist, of Camden, New Jersey; who has been assiduously engaged in experimenting upon the production of the above materials during the past year, with the object of reducing the expense of manufacturing the new metal aluminum.

Professor Frazer explained to the meeting the process of manufacturing this metal.

He alluded to the purity of the clay, which had been procured from Woodbridge, near Amboy, N. J., and from which the specimens of aluminum exhibited, had been extracted; that this clay was very white, and contained very little iron, as illustrated by the whiteness and purity of the preliminary preparation, alumina. He also said that the specimens of sodium, and chloride of aluminum, were more beautiful and in greater mass than he ever saw before.

Of the specimens of sodium especially, the Professor spoke in very high terms; alluding to the process of manufacturing, the same adopted by Mr. A. Monnier, who had succeeded in preventing the destruction of the apparatus employed in its manufacture, an evil which had hitherto formed a most serious obstacle to its production in any large quantities.

He also alluded to the continuous process of manufacturing sodium, adopted by Mr. A. Monnier, and compared its advantages over the ordinary process to those of the perpetual limekiln over those of ordinary construction; and that he was satisfied that if the sodium could be produced at a moderate cost, as appeared probable from Mr. M.'s statements, it would be of immense advantage to arts and manufactures. The specimens of aluminum, was, to all appearance, remarkably pure, and superior to that imported from Paris; and might eventually be manufactured in

such quantities, and at so low a price, as to be used in the construction of an endless variety of useful articles.

Mr. Howson, also, exhibited a working model of W. B. Coates' patent apparatus for cutting standing stalks or bushes of hemp, corn, sugar-cane, and cotton bushes. This machine will be found minutely explained and illustrated in the present number of this *Journal*, under the head of "Mechanical Engineering as applied to Farm Implements."

Mr. H., also, exhibited a beautifully finished full sized model of a safety feed and blow-off apparatus for steam boilers, for which a patent was lately granted to Mr. Frick, of this City.

A full illustrated explanation of this ingenious and efficient contrivance, will be given in a future number of this *Journal*.

Washington Jones exhibited some specimens of manilla hemp, in which the fibres were over five feet in length, and very fine; also, some of the same material, grown at Tampico, but having a shorter and coarser fibre. Much of the latter is used in the manufacture of scrubbing and sweeping brushes, for which it seems well adapted, being cheaper than bristles and much stiffer. After undergoing the process of curling and baking, it is used as a substitute for the hair in mattrasses; and seems to be a better article for the purpose, particularly on shipboard, as no unpleasant odor can arise from it should it get wetted.

Dr. Turnbull brought to the notice of the Institute, the new "Police and Fire Alarm Telegraph." He exhibited one of the signal boxes, and made the following remarks:

The Philadelphia Police and Fire Alarm Telegraph is now complete, and in working order, extending through a hundred miles of streets, having 24 offices, and over 80 alarm stations. But few telegraph lines of equal extent in the United States, have cost so small a sum, and are so well built, the whole expense not exceeding $33,000. Its utility in case of a conflagration has already been tested with the most gratifying results, also its usefulness in restoring lost children and property. In case of riot, the police can be concentrated and brought to the scene of strife, thus nipping it in the bud. As the telegraph has become a matter of general interest to the public, the following facts in relation to it have been collected, in order to give the Members of the Institute an idea of the nature of its operation. It was constructed under the contract with Messrs. Philips & Robinson, each having given it his immediate supervision. The Police and Fire Alarm Telegraph, are, while combined, yet distinct, each being complete in itself.

The "Police Telegraph," consists of three distinct circuits or lines of wires, dividing the city, for police purposes, into three sections. All the stations in each section or circuit, being connected with each other as well as with the central office.

The instruments used are very simple, and within the capacity of almost any one who can read and write, yet fully adequate for the transmission of any business which may be required of them. Each police office or station is provided with a magnet and alarm bell—by which they are called—and also the telegraph instrument, which has a dial, on which are marked the letters of the alphabet, and the numerals from 1 to 0. In the centre of the dial, is a hand or pointer, like that on the

dial of a clock, which hand is thrown forward one letter each time the circuit is broken. This is done by means of a single key, which on being pressed down, breaks the connexion between the wires, and on being released springs up again, always insuring a closed circuit when not in actual use; thus guarding against negligence. Suppose the word (cent) is to be written, the operator writing strikes his key rapidly thus repeatedly opening and closing the circuit until the indicator or hand has been thrown forward to the letter or figure he wishes to designate, in this case the letter C, then pauses an instant; this has thrown the hand on the dials (his own as well as the receiving offices) forward, thus: A B C; he then goes on two strokes, and a pause, D E; again nine strokes, F G H I J K L M N; O P Q R S T. Again 7 strokes U V W X Y Z &. The capitals show the pauses, and the character, &, shows the end of the word, and is also the starting point. A large proportion of the ordinary set phrases in daily use, are arranged to be given by a combination of numerals. Thus, 328, "Who is in charge of the station house?" Reply, 359, "The Lieutenant is in charge;" or, 362, "The First Sergeant."

Again, 976, "Are there any indications of riot in your District?" To which is replied, 4, "Yes," or 7, "No." These can be given by the bell, or on the figures on the dial; thus expediting the operations very much in the every day business of the telegraph. The wires of the Fire Alarm Telegraph, are, as we said, distinct from the police, and form a sort of net-work over the built-up portion of the City; with signal boxes or stations at points convenient of access, which boxes contain an apparatus so simply arranged, that an alarm can be given by any one who can reach the box. The only operation consisting in moving a small brass button, which extends through the inner case, from right to left, through an opening in the case about three inches in length. The direction in which it is to be moved is indicated by a dart, and is the only way it can be moved. The person who has thus moved it, lets go of it. He has by this movement wound up a spring, and at the same time set in motion a train of clock-work, which carries the apparatus necessary to communicate the alarm to the central office (State House).

Each box in the City is numbered, and in running down after being set in motion as described, strikes on a small bell at the central office its own number, and at the same time records it on a slip of paper, connected with an improved Morse instrument peculiarly adapted to this purpose. The alarm thus received is at once communicated to the State House Steeple, and to all the station houses, and at the same time the number of the box giving the alarm is struck on a small bell which is contained in each of the boxes.

Thus, a person in Richmond is desirous of knowing the precise locality of the fire.

When the State house bell is striking the district he goes to the box nearest him, and hears four strokes on the bell, and a pause followed by a single stroke, meaning 41. He then ascertains that the fire is in the vicinity of Third and Market Streets (41 being the number of the box at that corner).

A speaking tube connects the Mayor's Office with the central telegraph office, to be used in sending orders to the different station houses, receiving

answers and other police communications; and a similar one is put up between the central office and the bell ringer's apartment in the State House steeple, so as to give intelligence of fires the instant it is received from any portion of the City.

The line, it is conceded by all acquainted with telegraph business, has been constructed in the best possible manner, every attention having been paid to the smallest details, while the prominent features of the work are carried out in excellent style. It has been placed in competent hands, Mr. William J. Philips, the newly elected Superintendent being known as one of the most capable, efficient, and talented operators of the present day.

COMMITTEE ON SCIENCE AND THE ARTS.

Stated Meeting, May 8th, 1856.

Dr. B. H. Rand, Chairman, pro tem.

Sub-committee appointed.

No. 696—To examine Wm. F. Brooks' process for Manufacturing Seamless Metallic Tubes.

Reports of sub-committees read.

No. 677—On Ignition of Saw-dust at a low temperature in the Factory of Joseph Elkinton & Son; recommitted at request of chairman of sub-committee.

No. 682.—On Linus Yales' Locks and Iron Doors and Shutters, read first time, and laid on the table.

No. 684.—On Louis Rossett's Twin Articulation Boat.

" 688.— " John Tremper's Pneumatic Rotary Governor.

" 693.— " H. Whitall's Moveable Planisphere.

" 694.— " Prof. W. Chauvenet's Great Circle Protractor.

The above reports having passed the second reading were adopted; and Nos. 688, 693, and 694, referred to the Committee on Publications.

COMMITTEE ON SCIENCE AND THE ARTS.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination, "A Great Circle Protractor," invented by Professor W. Chauvenet, Annapolis, Maryland—REPORT:

That the object of the instrument is to give to navigators a simple and accurate mode of laying down upon their charts, the great circle of the earth, which passes through their points of departure and destination, and is known to be the shortest distance between those points over the surface of the earth. Now, if such a line be drawn upon the surface of a celestial globe, it will be seen that it does not make equal angles with the successive meridians—and its course cannot easily be laid down upon

the ordinary charts (Mercator's) without elaborate calculations, or the use of some auxiliary instrument such as we have now under notice.

The Protractor of Professor Chauvenet, consists of a stereoscopic projection of the sphere of moderate size, upon which are laid down the meridians, and parallels of latitude for every degree. The degrees of longitude being numbered along the equator both ways, so that the circumference of the chart may be taken to represent the meridian of the point of departure, and the difference of longitudes between that and the point of destination, will indicate the position of this latter place by the chart. The parallels are numbered as usual from the equator, and hence the position of any point is marked upon this chart in its true latitude. Above this fixed chart, is a movable one printed upon a transparent material, and for the sake of clearness, in differently colored ink. But, the points corresponding to the poles in the fixed chart are here marked as the east and west points of the horizon, and the middle line of the curves passing through these points (the meridians of the ordinary chart,) is called the line of distances, while that line which corresponds to the equator is marked as the line of courses, and its extremities labeled N. and S. It will now easily be seen, that if the upper sheet be so turned, as to bring its east or west point to correspond with the position of the point of departure, as indicated upon the lower chart by its latitude, (it is to be remembered that its longitude is to be taken as 0, that is, it is to be taken on the margin of the chart,) and the position of the place of destination be also marked upon the chart, by its latitude and difference of longitude from the first, then one of the curves of the upper chart will be seen to pass through or near this place of destination, and such curve is the great circle of the earth which joins these two points upon the sphere. The latitude in which this curve crosses each successive meridian may be easily read off through the upper paper, and being marked upon the ordinary Mercator chart, will allow the proper course of the vessel to be easily and rapidly traced. If the curve be followed to the line of courses (or equator of the upper chart,) the corresponding graduation indicates the direction in which the vessel is to be headed at starting, and as often as this may be done during the voyage, using the ship's position at any time as the starting point, so often may the proper course for the vessel be determined. The parallel of the transparent chart, which passes through the point of destination is the circle of distance, and by following this down to the line of distances, we find recorded the number of degrees of arc, (or by multiplying this number by 60, the number of nautical miles,) intervening between the points of departure and destination.

It is obvious, moreover, that this arrangement of charts affords an approximate solution of all cases of spherical triangles, and may thus be used by navigators as a rough check upon their calculations.

Simple as this instrument is, it has long been a desideratum in nautical science, and has been sought for with great labor and anxiety by ingenious mathematicians and practical men; heretofore without success, until Prof. Chauvenet has furnished the present simple and practical solution which seems to leave nothing to be desired either as to simplicity or accuracy.

The Committee, therefore, believing the contrivance to be entirely new, and highly ingenious, and in consideration of its practical value, recommend that the Scott Legacy Premium be awarded to Prof. Chauvenet for his invention.

By order of the Committee,

Philadelphia, May 8th, 1856. WM. HAMILTON, *Actuary.*

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination, "an Improved Movable Planisphere," invented by Henry Whitall, of Philadelphia, Pennsylvania—REPORT:

That it consists of a map of the heavens projected upon the plane of the equator, the margin being divided along its circumference into months and days, and movable within a fixed border which is itself divided into the hours of day and night. Around the position of the North Pole as a centre, is movable an elliptical rim performing the part of the horizon, and divided into the various points of the compass; which rim is crossed by a meridian band, graduated into degrees of latitude extending on the one side 40° below the equator, on the other 50° from the pole. This rim or horizon is made elliptical to accommodate the map to variations in the latitude of an observer—and obtains this convenience at the expense of a scarcely perceptible error in the time of rising, and position of the stars. Now, if this planisphere be set, by bringing the proper day of the month to the noon-mark on the outer rim, and by bringing the index or southern point of the horizon to any required time of night, the portion of the map included within the bounds of the horizon will represent faithfully the visible heavens at that moment, or by bringing any given star to the eastern or western point of the horizon, the position of its rising and setting may be observed, while the index will indicate the time of this phenomenon, with an accuracy quite sufficient for general observations.

It will be seen, then, that the instrument furnishes a cheap portable and sufficiently accurate substitute for a celestial globe or a series of charts—and will be found very convenient for persons who desire to become familiar with the constellations, or to watch atmospheric phenomena, such as meteors, and note their apparent places and paths. Especially by persons desirous thus to occupy their time while away from their usual residences, will this neat contrivance be appreciated. The examination of the Committee have satisfied them that the map itself is quite sufficiently accurate in its places of the stars, for the purposes designed—and unhesitatingly express the opinion that it is deserving of commendation and patronage.

By order of the Committee,

Philadelphia, May 8, 1856. WM. HAMILTON, *Actuary.*

INDEX.

LIST OF AMERICAN PATENTS, WITH REMARKS, &c.

November, 1855.

			PAGE.
70.	Improvement in Knitting Machines,	Timothy Bailey,	5
71.	—— Mop Heads,	Alexander Burns,	ib.
72.	—— Cutting Teeth of Gear Wheels,	G. W. Bigelow,	ib.
73.	—— Locks,	J. H. A. Bleckman,	ib.
74.	—— Cotton Gins,	Lewis S. Chichester,	ib.
75.	—— Double Acting Pumps,	D. W. Clark,	ib.
76.	—— Ticket Holders,	E. Pierre Fraissinet and H. E. Reboul,	6
77.	—— Printing Yarns and Cloths,	Thomas Henderson,	ib.
78.	—— Treating Leather for Enamelling,	T. P. Howel and N. F. Blanchard,	ib.
79.	—— Hand Seed Planters,	D. W. Hughes,	ib.
80.	—— Tops to Seats of Carriages,	L. Jacobs and E. C. Landon,	ib.
81.	—— Potato Digger,	Aaron A. Marcellus,	ib.
82.	—— Policemen's Rattles,	Joseph McCord,	ib.
83.	—— Railroad Station Indicators,	Charles A. McEvoy,	ib.
84.	—— Gun Locks,	John Phin,	ib.
85.	—— Cotton Presses,	William F. and Charles J. Provost,	ib.
86.	—— Preparing Leather for Boots, &c.,	Charles Rice and S. H. Whorf,	ib.
87.	—— Marble Sawing Machine,	F. Noette and A. Schmidt,	ib.
88.	—— Street Sweeping Machine,	M. W. St. John and Isaac Brown,	7
89.	—— Coal Sifters,	Gerard Sickles,	ib.
90.	—— Tubes in Evaporating Pans, &c.,	George H. Thomas,	ib.
91.	—— Revolving Measuring Wheels,	Louis Young,	ib.
92.	—— Nutmeg Graters,	H. Carsley, ass'd to self and E. Brown,	ib.
93.	—— Lifting Jacks,	F. Drew, ass'd to self and S. S. Gray,	ib.
94.	—— Filtering Faucet,	L. Finger, ass'd to self and L. Schell,	ib.
95.	—— Mills for Grinding Coffee, &c.,	C. W. Van Vliet, ass'd to C. Parker,	ib.
96.	—— Envelopes,	Emanuel Harmon,	ib.
97.	—— Mills for Grinding Apples,	W. O. Hickok,	ib.
98.	—— Balances for Detecting Base Coin,	John Allender,	8
99.	—— Blacksmiths' Striker,	Dennis S. Blue,	ib.
100.	—— Steam Heating Apparatus,	Pliny E. Chase,	ib.
101.	—— Belt Coupling,	Thomas H. Corbett,	ib.
102.	—— Fences,	H. H. Dennis,	ib.
103.	—— Screw Cutting Machines,	Joel P. Heacock,	ib.
104.	—— Coopers' Tools,		
105.	—— Cathead Anchor Stoppers,	Peter H. Jackson,	ib.
106.	—— Bag Looms,	L. B. Jillson, and G. Sparhawk,	ib.
107.	—— Winnowing Machines,	John A. Krake,	ib.
108.	—— Umbrella Sticks, &c., of Ratan,	Joseph Kleeman,	ib.
109.	—— Cannon,	Alfred Krupp,	9
110.	—— Cutting the Uppers of Boots,	John S. Lewis,	ib.
111.	—— Attaching Casters to Trunks,	Leonard S. Maring,	ib.
112.	—— Rasping Heels & Soles of Boots,	Jean Pierre Molliere,	ib.
113.	—— Ovens for Baking Bread,	Jean Louis Roiland,	ib.
114.	—— Sewing Machines,	George W. Stedman,	ib.
115.	—— Printing Press,	Cyrus A. Swett,	ib.
116.	—— Metallic Saddle Trees for Harness,	Samuel E. Thompkins,	ib.
117.	—— Feet Warmers,	Nathaniel Waterman,	ib.
118.	—— Fluid Lamps,	W. Bennett, ass'd to Union I. R. L. C.,	ib.

ADDITIONAL IMPROVEMENT.

1. Improvement in Warming Houses, Henry Ruttan, . 9

RE-ISSUES.

1. Improvement in Harvesting Machines, Jonathan Haines, . . 10

DESIGNS.

1. For Coal Stoves, . . G. Smith & H. Brown, ass'd to Leibrandt, McDowell & Co., 10
2. — Stoves, . . Benjamin Wardwell, . ib.
3. — Steam Tubes and Hot Air Covers, J. O. Morse and J. W. Adams, . ib.

December, 1855.

1. Improvement in Ships' Yards, . Thomas Batty, . 10
2. — Cutting Pile Fabrics, Erastus B. Bigelow, . ib.
3. — Hanging Window Sashes, . E. W. Bullard, . ib.
4. — Military Saddles, . Daniel Campbell, . . ib.
5. — Plough Mould Boards, . Thomas A. Chandler, . ib.
6. — Sawing tapering blocks Marble, John A. Cole, . . 11
7. — Chamfering edges of Shoe Soles, A. R. Dinsmoor and L. J. Bartlett, ib.
8. — Flues, &c., in Cooking apparatus, John A. Elder and Wm. J. Thorn, ib.
9. — Car Coupling, . Joseph T. England, . ib.
10. — Wool Combing Machines, . Peter Fairbairn and J. Hargrave, ib.
11. — Feet Warmers, . Henry Fourcrook, . . ib.
12. — Military Wagons, . Joseph Francis, . ib.
13. — Bagasse Furnaces, . Samuel H. Gilman, . . ib.
14. — Burglars' Alarm, . Samuel Hamilton, . ib.
15. — Cutting Boot and Shoe Soles, Jesse W. Hatch, . . ib.
16. — Burglars' Alarm, . Horace L. Hervey, . ib.
17. — Hand Cotton Pickers, . George A. Howe, . . ib.
18. — Cutting the front, &c., of Violins, Matthias Keller, . . 12
19. — Amalgamators, . Edward N. Kent, . ib.
20. — Locks, . . Edward Kershaw, . ib.
21. — Pumps, . Hosea Lindsey, . ib.
22. — Spoke Machines, . Thomas R. Markillie, . ib.
23. — Machines for Scouring Knives, G. M. Morris and J. Newton, ib.
24. — Locks, . J. H. Pomeroy, . ib.
25. — Photographic Bath, . Isaac Rehn, . . ib.
26. — Boot Trees, . . James H. Sampson, . ib.
27. — Hot Blast for Furnaces, . Charles Schinz, . . ib.
28. — Cloth Stretching Rollers, Nathan Simmons, . ib.
29. — Regulator Valve, Governor Stem, John Tremper, . . 13
30. — Blind Fastener, . Daniel E. True, . ib.
31. — Paring and Slicing Apples, . Levi Van Hoesen, . . ib.
32. — Quartz Crushing Machines, Richard Vose, . ib.
33. — Hand Sowers, . Moses D. Wells, . . ib.
34. — Cotton Seed for Planting, . R. C. Wrenn, . ib.
35. — Water Wheels, . John H. Gatiss, ass'd to A. Edwards, ib.
36. — Channeling Stone, . J. Taggart, ass'd to self and V. Brown, ib.
37. — Gimlet, . C. C. Tolman, ass'd to J. Sargent and Daniel P. Foster, . 14
38. — Feeding Cotton to the Gin, Major B. Clarke, . ib.
39. — Embossed Leather, . Israel Amies, . . ib.
40. — Folding and Measuring Cloth, James Baxendale, . ib.
41. — Boot and Shoe Peg Cutters, Henry E. Chapman, . ib.
42. — Fountain Ink Stand, . Charles T. Close, . ib.
43. — Water Gauges for Steam Boilers, Josephus Echols, . . ib.
44. — Gas Apparatus, . J. S. Gallaher, Jr., and J. W. Smith, ib.
45. — Railroad Car Springs, . P. G. Gardiner, . ib.
46. — Tile Roofing, . Gottlieb Graessle, . . ib.
47. — Buckles, . Sheldon S. Hartshorn, . 15
48. — Raking and Loading Hay, John K. Harris, . . ib.

49.	Improvement in Bedsteads,	Benjamin Hinkley,	15
50.	—— Extinguishers to Lamps,	F. A. Jewett,	ib.
51.	—— Locks for Freight Cars,	Henry C. Jones,	ib.
52.	—— Corn Shellers,	James J. Johnson,	ib.
53.	—— Sand Paper Making Machines,	Gilbert D. Jones,	ib.
54.	—— Cutting Out, &c., of Boots, &c.,	Jean Pierre Molliere,	ib.
55.	—— Calico Printing,	Robert Prince and A. Lovis,	ib.
56.	—— Marble, &c., in Taper Form,	George T. Parsall,	ib.
57.	—— Pistons for Steam Engines,	Joel W. Pettis,	ib.
58.	—— Impact Water Wheel,	Atchison Queal,	16
59.	—— Carriage Hubs,	Shepherd W. Reed,	ib.
60.	—— Cutting Articles from Leather,	C. Rice and S. H. Whorf,	ib.
61.	—— Carving Wood, &c.,	Isaac M. Singer,	ib.
62.	—— Corn Shellers,	Jeremiah P. Smith,	ib.
63.	—— Slide Valves for Steam Engines,	E. D. Leavitt, Jr.,	ib.
64.	—— Piano Forte Action,	Francis Taylor,	ib.
65.	—— Auger Handles,	Guillaume Henri Talbot,	ib.
66.	—— Cutting Cloaks,	Amasa S. Thompson,	ib.
67.	—— Manufacture of Cannon,	Daniel Treadwell,	ib.
68.	—— Devices for Bleaching Ivory,	Wm. M. Welling,	17
69.	—— Chain Making Machine,	Edward Weissenborn,	ib.
70.	—— Rotary Pumps,	C. D. Wright,	ib.
71.	—— Mosquito Curtains	John S. Martin,	ib.
72.	—— Circular Saws,	A. D. Highfield, ass'd to self & W. H. Harrison,	ib.
73.	—— Harvester Rakers,	J. W. Haggard and G. Bull, ass'd to Bull, Haggard, & Newsteter,	ib.
74.	—— Cut-off Gear for Steam Engines,	W. W. Wade, ass'd to Wade & Burnham,	18
75.	—— Machine for Rubbing Types,	D. Moore, ass'd to self and others,	ib.
76.	—— Looms for weaving Pile Fabrics,	Erastus B. Bigelow,	ib.
77.	—— Grain Cleaning Machines,	Jonathan L. Booth,	ib.
78.	—— Saw-Set,	T. C. Bush,	ib.
79.	—— Exhaust Pipes of Locomotives,	William E. Cooper,	ib.
80.	—— Paddle Wheels,	Frederic W. Capon,	ib.
81.	—— Fire Arms,	Joseph C. Day,	ib.
82.	—— Piano Fortes,	Spencer B. Driggs,	ib.
83.	—— Crank Piece for Augers,	John Gourlay,	19
84.	—— Feed Motion for Saw Mills,	Henry C. Green,	ib.
85.	—— Spike Machines,	A. M. George,	ib.
86.	—— Measuring Music,	H. B. Horton,	ib.
87.	—— Planing Felloes,	Wm. W. Johnson,	ib.
88.	—— Moulds for Casting Bells,	Eber Jones,	ib.
89.	—— Stuffing Horse Collars,	S. B. McCorkle,	ib.
90.	—— Polishing, &c., Boots & Shoes,	Jean Pierre Molliere,	ib.
91.	—— Uppers of Boots, &c., on Lasts,		
92.	—— Stone Dressing Machines,	Oldin Nichol and A. M. George,	20
93.	—— Focal Length of the Eye,	Daniel Parish,	ib.
94.	—— Mill Spindle Steps,	Isaac N. Parker,	ib.
95.	—— Horse Powers,	Samuel Pelten,	ib.
96.	—— Gate for Railroad Crossings,	George B. Pullinger,	ib.
97.	—— Finishing Grooves in Patterns,	John P. Robinson,	ib.
98.	—— Shingle Machine,	Joel Tiffany and Milo Harris,	ib.
99.	—— Organ Melodeons,	Thomas F. Thornton,	21
100.	—— Piano Fortes,	Hubert Shonacker,	ib.
101.	—— Treating Galena or Lead Ore,	Julius E. Schowbe,	ib.
102.	—— Attaching Hubs to Axles,	Eliphalet S. Scripture,	ib.
103.	—— Felting Hat Bodies,	Isaac Searless,	ib.
104.	—— Saw-Set,	Isaac Spaulding,	ib.
105.	—— Horse Collars,	Samuel Shattuc,	ib.
106.	—— Sewing Machines,	Isaac M. Singer,	ib.
107.	—— Suckers for Pumps,	Joseph Weis,	ib.
108.	—— Locks,	Thomas Bowles, ass'd to R. M. Patrick,	ib.
109.	—— Velocity of Wind Mills,	J. Burnit, ass'd to self and J. Clark,	ib.

110. Improvement in Woven Fabrics,	John Healy, ass'd to James Bishop,	22
111. —— Cooking Stoves,	J. B. Lancaster, adm'r of J. R. Lancaster,	ib.
112. —— Lamp Extinguishers,	Elijah Richmond, ass'd to Ira Noyes,	ib.
113. —— Candle Mould Apparatus,	Lewis C. Ashley,	87
114. —— Vapor Bath,	Joseph Buhler, M. D.,	ib.
115. —— Injecting Syringes,		
116. —— Cranes,	Benijah J. Burnett,	ib.
117. —— Time Indicators,	George Byington,	ib.
118. —— Double-Acting Steam Brake,	Robert L. Curry,	ib.
119. —— Rotary Pumps,	Thomas Crane,	ib.
120. —— Window Shades,	Thomas Danforth,	ib.
121. —— Whipping Hair,	Isaac Davis,	ib.
122. —— Hanging Saws,	Soranus Dunham,	88
123. —— Steam Boiler Furnaces,	Henry F. and Louis A. Gossin,	ib.
124. —— Wrought Iron Cannon,	John Griffin,	ib.
125. —— Dressing Mill Stones,	Bishop J. Harris,	ib.
126. —— Seeding Machines,	Reuben Hurd,	ib.
127. —— Apparatus for Making Salt,	John P. Hale,	ib.
128. —— Paddle Wheels,	Benjamin Hill,	ib.
129. —— Hanging Circular Saws,	Westel W. Hurlbut,	ib.
130. —— Mincing Meat,	Alexander Lightheiser,	ib.
131. —— Hoisting Blocks,	William H. Merrill,	ib.
132. —— Hulling Machines,	Charles Miller,	ib.
133. —— Proportional Dividers,	Henry M. Parkhurst,	89
134. —— Log and Sounding Line,	Adolphe Pécoul,	ib.
135. —— Fountain Pens,	Newell A. Prince,	ib.
136 —— Mills for Grinding Grain, &c.,	Ezra Ripley,	ib.
137. —— Corn Shellers,	James Bobb,	ib.
138. —— Extension Bits,	John P. Rollins,	ib.
139. —— Revolving Fire Arms,	E. K. Root,	ib.
140. —— Looms for Weaving Wire,	George W. Smith,	ib.
141. —— Breech Loading Fire Arms,	Gilbert Smith,	ib.
142. —— Corn and Cob Mills,	Thomas B. Stout,	ib.
143. —— Hand Seed Planters,	Ancil Stickney,	90
144. —— Sad Iron Heaters,	Jesse D. Wheelock,	ib.
145. —— Hydraulic Oil Presses,	William Wilber,	ib.
146. —— Guards for Lanterns,	C. H Butterfield, ass'd to A. Houghton,	ib.
147. —— Revolving Grates,	C. Evans, ass'd to self & G. K. Goodwin,	ib.

RE-ISSUES.

1. Improvement in Sticking pins in paper,	Samuel Slocum,	90
2. —— Mortising Machines,	Joseph Guild,	91
3. —— Reaping and Mowing Machines,	Samuel Rockafellow,	ib.
4. —— Spark Arresters,	Wm. C. Grimes,	ib.
5. —— Sofa Bedsteads,	Charles F. Martin,	ib.

DESIGNS.

1. For Parlor Stoves to Burn Wood,	Conrad Harris and Paul W. Zoiner,	91
2. —— Clock Frames,	Jonathan C. Brown,	ib.
3. —— Parlor Stove to Burn Coal,	Conrad Harris and Paul W. Zoiner,	ib.
4. —— Six Plate Box Stoves,		
5. —— Cooking Stoves,		
6. —— Strap Hinges,	Enoch Woolman,	92
7. —— Ships' Caboose Stoves,	A. A. Lincoln, Jr.,	ib.
8. —— Table Knives and Forks,	J. W. Gardiner, ass'd to Lamson, Goodnow & Co.,	ib.

January, 1856.

1. Improvement in Furnace Soldering,	Philo Brown,	92
2. —— Chain for Power Press,	Nathan Chapman,	ib.
3. —— Slide Valves,	James Cochrane,	ib.
4. —— Nut Box,	Richard Cole,	ib.

5.	Improvement in Brick Presses,	John B. Collen,	92
6.	—— Ploughs,	George W. Cooper,	ib.
7.	—— Safety Guards for Railroad Cars,	John G. Crocker,	ib.
8.	—— Wind Mill,	Benjamin Fenn,	ib.
9.	—— Printing Press,	George P. Gordon,	ib.
10.	—— Repeating Fire Arms,	Benjamin Grooms,	93
11.	—— Spoke Shave,	Elijah Holmes,	ib.
12.	—— Shirt Collars,	Walter Hunt,	ib.
13.	—— Pegging Boots and Shoes,	Waterman B. Johnson,	ib.
14.	—— Smoke Houses,	Moses Kendall,	ib.
15.	—— Sewing Machines,	Phineas L. Slayton,	ib.
16.	—— Gold Amalgamator,	Daniel Liebee,	ib.
17.	—— Pump,	Charles N. Lewis,	ib.
18.	—— Making Eave Troughs,	Orson E. Mallory,	ib.
19.	—— Harvesters,	John H. Manny,	94
20.	—— Lath Sawing Machines,	Thomas R. Markillie,	ib.
21.	—— Sash Lock,	Joseph Marsh,	ib.
22.	—— Pump,	James Neal and C. W. Emery,	ib.
23.	—— Padlocks,	I. J. Oldis,	ib.
24.	—— Hay and Cotton Presses,	Joseph Peevy,	ib.
25.	—— Circuit Breakers,	C. Robinson and C. T. Chester,	ib.
26.	—— Steam Boiler Alarms,	Thomas Stubblefield,	ib.
27.	—— Repeating Magazine Fire Arms,	John C. Smith,	ib.
28.	—— Velocimeters for Vessels,	Ira F. Thompson,	ib.
29.	—— Grain Binders for Harvesters,	George W. N. Yost,	ib.
30.	—— Compositions for Treating Wool,	Andrew H. Ward, Jr.,	95
31.	—— Rollers for Planing Machines,	Hiram C. Wright,	ib.
32.	—— Pump for Diving Bells,	George Williamson,	ib.
33.	—— Leather Shoe Bindings,	Joshua Turner, ass'd to W. Covel,	ib.
34.	—— Screw Machines,	C. Whipple, ass'd to the N. E. S. Co.,	ib.
35.	—— Treating Oils,	P. Marsh, ass'd to Marsh & Howland,	ib.
36.	—— Harvester Raking Apparatus,	G. A. Clarke, ass'd to W. Clarke,	ib.
37.	—— Ploughs,	Benjamin F. Avery,	ib.
38.	—— Making Illuminating Gas,	N. Aubin,	ib.
39.	—— Harvesters,	Lebeus Barnes,	ib.
40.	—— Mode of Hanging Double Doors,	Charles E. Brown,	96
41.	—— Constructing Bottoms of Ships,	Samuel W. Brown,	ib.
42.	—— Sheet Metal Bending,	Reuben Brady,	ib.
43.	—— Coal Scuttle Covers,	Irah Chase, Jr.,	ib.
44.	—— Bee Hives,	George H. Clarke,	ib.
45.	—— Form of Building Bricks,	Edgar Conckling,	ib.
46.	—— Disinfecting Fecal Matter,	Dominique Emile Coutaret,	ib.
47.	—— Street Paving Machines,	Thomas Davidson, Jr.,	ib.
48.	—— Filing Saws,	Jacob Erdle,	ib.
49.	—— Watch Key,	M. Falkenan, M. Pollak & S. Wiener,	ib.
50.	—— Breech Loading Fire Arms,	L. H. Gibbs,	ib.
51.	—— Hammer Heads to Shafts,	Charles Hammond,	97
52.	—— Padlocks,	James Harrison, Jr.,	ib.
53.	—— Peg Cutters for Boots and Shoes,	Samuel R. Jones,	ib.
54.	—— Making Weavers' Harness,	George L. Jenks,	ib.
55.	—— Manufacture of Hats,	Joseph Johnson,	ib.
56.	—— Mode of Sawing Wet Fuel,	John F. Manahan,	ib.
57.	—— Gas Cooking Stoves,	Hiram B. Musgrave,	ib.
58.	—— Cheese Presses,	William C. Pancost,	ib.
59.	—— Loading Dirt Cars,	Charles Phillips,	ib.
60.	—— Horse Hay Rakes,	Randall Pratt,	ib.
61.	—— Excavating Machines,	J. J. Savage,	98
62.	—— Preventing Bank Notes, &c., from being Counterfeited,	Christopher D. Scropyan,	ib.
63.	—— Mowing Machines,	Gustavus Stone,	ib.
64.	—— Mortising Machine,	William Stoddard,	ib.
65.	—— Sawing Marble Obelisks,	Abraham Straud,	ib.
66.	—— Seeding Machines,	John G. Snyder,	ib.

67.	Improvement in Candlesticks,	Abner Whitely,	98
68.	—— Cultivating Ploughs,	William E. Wyche,	ib.
69.	—— Corn Harvesters,	George W. N. Yost,	ib.
70.	—— Fire Arms,	James H. Merrill,	99
71.	—— Mowing Machines,	H. Pease, ass'd to self and J. Roby,	ib.
72.	—— Harvesters,	John Reily, ass'd to self and others,	ib.
73.	—— Manufacture of Boots & Shoes,	S. H. Whorf, ass'd to self & C. Rice,	ib.
74.	—— Rudder of Stern Propellers,	John Beattie,	ib.
75.	—— Dial for Dividing Engines,	William H. Brown,	ib.
76.	—— Extension Railroad Car,	Joseph S. Brown,	ib.
77.	—— Feeding Paper to Print'g presses,	Samuel I. Chapman,	ib.
78.	—— Curing Varicocele, &c.,	Joseph Cheever,	100
79.	—— Heading Bolts,	H. M. Clarke,	ib.
80.	—— Securing Glasses to Lanterns,	Hezekiah Crout,	ib.
81.	—— Heading Spikes,	Elisha H. Collier,	ib.
82.	—— Operating Fire Engines,	John P. Philo and George Cowing,	ib.
83.	—— Hydrant,	C. J. Cowperthwait,	ib.
84.	—— Gas Burners,	C. A. Cummings and C. Douglass,	ib.
85.	—— Lock Gate Valves,	Dewitt C. Cummings,	ib.
86.	—— Extension Tables,	Edward A. Curley,	ib.
87.	—— Reefing Sails,	Henry D. P. Cunningham,	ib.
88	—— Fire Arms,	Joseph C. Day,	101
89.	—— Attaching Thills to Axles,	Allen Greene,	ib.
90.	—— Implements for Pruning Trees,	W. W. Harvey,	ib.
91.	—— Cotton Presses,	Caleb S. Hunt,	ib.
92.	—— Regulating Speed of Wind-mills,	Frank G. Johnson,	ib.
93.	—— Brick Machines,	Richard W. Jones,	ib.
94.	—— Shingle Machine,	A. Kendall,	ib.
95	—— Grain and Grass Harvesters,	William F. Ketchum,	ib.
96.	—— Shingle Machine,	Samuel M. King,	102
97.	—— Steering Wheel Stopper,	W. R. Lavender and Atkins Smith,	ib.
98.	—— Tenoning Spokes, &c.,	Horatio McGrath,	ib.
99.	—— Mortising Machine,	J. A. Merriman,	ib.
100.	—— Safety Coal Hole Covers,	F. H. Moore,	ib.
101.	—— Steam Stop-Valves,	James McNabb and Adam Carr,	ib.
102.	—— Dressing Mill Stones,	R. D. Nesmith,	ib.
103.	—— Making Clothes Pins,	Ephraim Parker,	ib.
104.	—— Washboards,	Ira S. Parker,	ib.
105.	—— Door Fastenings,	Reed Peck,	ib.
106.	—— Cargo Ports for Ships, &c.,	Charles Perley,	ib.
107.	—— Remelting Iron Scraps,	Abiel Pevy,	ib.
108.	—— Casting Metals,	Ezra Ripley,	103
109.	—— Straw Cutters,	Samuel T. Sharp,	ib.
110.	—— Ditching Machines,	Thomas J. Stratton,	ib.
111.	—— Revolving Fire Arms,	Eben T. Star,	ib.
112.	—— Platform Scales,	Francis M. Strong and Thomas Ross,	ib.
113.	—— Yarn Dressing Frames,	Abner J. Sutherland,	ib.
114.	—— Felting Hats,	James S. Taylor,	ib.
115.	—— Coating Daguerreotype Plates,	Joseph H. Tompkins,	ib.
116.	—— Curtain Fixtures,	Lewis White,	ib.
117.	—— Oscillating Engines,	Hugh Wightman and W. Warden,	104
118.	—— Steam Valves as Cut-offs,	C. H. Brown, ass'd to "Putnam M. Co.,"	ib.
119.	—— Lathe Machine,	J. L. Brown, ass'd to self & C. Learned,	ib.
120.	—— Grain and Grass Harvesters,	Gelston Sanford and T. and S. Hull,	ib
121.	—— Hanging Mill Stones,	D. Marsh, ass'd to T. B. Stout & others,	ib.
122.	—— Hydro-Carbon Vapor Apparatus,	A. Davis, ass'd to A. W. Adams & others,	ib.
123.	—— Bending Plough Handles, &c.,	Benjamin F. Avery,	160
124.	—— Opening & Closing Farm Gates,	J. A. Ayres,	ib.
125.	—— Flouring Mills,	Thomas Crane,	ib.
126.	—— Eccentric Explosive Shells,	Wm. W. Hubbell,	ib.
127.	—— Cotton Seed Planters,	J. M. Jones, ass'd to Newton Foster,	ib.
128.	—— Arrangement of Tan Vats,	David H. Kennedy,	ib.
129.	—— Sticks to Polygonal Forms,	Joseph W. Killam,	ib.

130.	Improvement in Riveting Machines,	Emmons Manly,	160
131.	—— Mowing Machines,	Joseph S. Manning,	ib.
132.	—— Ventilating Railroad Cars,	Wm. H. Medcalfe,	161
133.	—— Hammering Leather for Boots,	Jean Pierre Molliere,	ib.
134.	—— Sewing Machines,	John O'Neil,	ib.
135.	—— Grate Bars,	John T. Osborn,	ib.
136.	—— Velocity of Wind Wheels,	Francis Peabody,	ib.
137.	—— Seed Planters,	Freeman Plummer,	ib.
138.	—— Steam Valves in Blower Engines,	James P. Ross,	ib.
139.	—— Boxing Carriage Wheels,	Charles Schmitt,	ib.
140.	—— Cartridges of Fire Arms,	H. Smith and D. P. Wesson, ass'd to "The Volcanic Repeating Arms Co.,"	ib.
141.	—— Grain and Grass Harvesters,	John H. Manny,	ib.
142.	—— Harvester Cutter Bars,		
143.	—— Throttle Valve of Steam Engines,	Abel Bisbee,	162
144.	—— Shot Pouches,	Joseph T. Capewell,	ib.
145.	—— Field Fences,	Thomas J. Carleton and Stephen Post,	ib.
146.	—— Locomotive Furnace Grates,	George R. Comstock,	ib.
147.	—— Replacing Railroad Cars,	Henry A. Degraw,	ib.
148.	—— Brick Machines,	Louis T. Delassize,	ib.
149.	—— Scaffolds,	Charles Foster,	ib.
150.	—— Telegraphic Registers,	Moses G. Farmer,	ib.
151.	—— Heating Buildings by Steam,	Stephen J. Gold,	ib.
152.	—— Connecting Shafts, &c.,	John Hinkley,	163
153.	—— Mortising Tool,	Hazard Knowles,	ib.
154.	—— Pill Making Machines,	Noah W. Kumler,	ib.
155.	—— Stenciling Window Shades,	Daniel Lloyd,	ib.
156.	—— Mastich for Covering Walls,	Adolph C. Moestue,	ib.
157.	—— Grinding Mills,	Lucius Paige,	ib.
158.	—— Cutting Flocks and Paper Stock,	Joseph N. Pitts,	ib.
159.	—— Punching Machine,	Rufus Porter,	ib.
160.	—— Hinge,	George M. Ramsay,	ib.
161.	—— Bee-Hives,	H. G. Robertson,	ib.
162.	—— Clearing Snow from R.R. Tracks,	Riley Root and S. G. Holyoke,	164
163.	—— Screw Jacks,	Henry F. Shaw,	ib.
164.	—— Chimney Cowls,	C. F. Thomas,	ib.
165.	—— Attaching Teeth to Saw Plates,	Philos B. Tyler,	ib.
166.	—— Tree-nail Machines,	Elbridge Webber,	ib.
167.	—— Buggy Wagons,	Thomas Winans,	ib.
168.	—— Belt and Band Fastenings,	George D. Young,	ib.
169.	—— Soldering Iron,	Daniel Dod, ass'd to self and H. F. Read,	ib.
170.	—— Cutting Mouldings on Marble,	H. L. Houghton, ass'd to A. H. Grennel,	ib.
171.	—— Cell Lock,	E. Kershaw, ass'd to self & H.M.Hooper,	ib.
172.	—— Flouring Mills,	Joseph Weis,	ib.

RE-ISSUES.

1.	Improvement in Ploughs,	Samuel Hulbert,	164
2.	—— Cotton Presses,	Nathan Chapman,	165
3.	—— Composing and Setting Types,	William S. Loughborough,	ib.
4.	—— Washing Paper Stock,	Horarce W. Peaslee,	ib.
5.	—— Clearers for Grass Harvesters,	Abner Whitely,	ib.
6.	—— Threshing and Winnowing Grain,	Andrew Ralston,	ib.
7.	—— Sewing Machines,	T. J. W. Robertson, ass'd to self and Alfred E. Beach,	ib
8.	—— Dissolving Silica,	Benjamin Hardinge,	166
9.	—— Sewing Machines,	Allen B. Wilson,	ib.
10.	—— Do. do.		
11.	—— Grinding Mills,	Amory Felton,	ib.
12.	—— Harvesting Machines,	John Reily,	ib.

DESIGNS.

1.	For Hall Pendants,	S. B. H. Vance, assignor to Mitchell, Bailey & Co.,	166
2.	—— Do. or Chandeliers,		
3.	—— Perfumery Bottles,	Augustus E. Wetherill,	ib.

4. For Cooking Stoves,	G. Smith, H. Brown, & J. A. Read, ass'd to J. G. Abbott & A. Lawrence,	167
5. —— Portable Furnaces,	G. Smith, H. Brown, and J. A. Read, ass'd. to A. E. Warfield,	ib.
6. —— Portable Ranges,		

February, 1856.

1. Improvement in Bell Stench Traps,	Charles H. Bush,	167
2. —— Corn Dryers,	Solomon Bernheisel,	ib.
3. —— Ore Washer,	William Ball,	ib.
4. —— Raking Attachment to Harvester,	A. H. Caryl,	ib.
5. —— Photographic Plate Vise,	Levi Chapman,	ib.
6. —— Lugs for Cast Iron Shingles,	John Cook,	ib.
7. —— Pumps,	E. N. Dickerson and E. K. Root,	ib.
8. —— Apparatus for Locomotives,	Peter S. Ebbert,	168
9. —— Saw Set,	Joseph G. Ernest,	ib.
10. —— Cutting Files,	Major H. Fisher, ass'd to J. A. Hyde,	ib.
11. —— Three Wheeled Vehicles,	Elisha S. French,	ib.
12. —— Feed-water to Steam Boilers,	Thomas Firth,	ib.
13. —— Bench Vise,	Thomas Gissinger,	ib.
14. —— Making Rope,	Elisha Harris,	ib.
15. —— Brick Presses,	Henry J. Hughes,	ib.
16. —— Hot Air Furnaces,	Samuel Macferran,	ib.
17. —— Carriage Springs,	Richard Montgomery,	ib.
18. —— Weighing Scales,	S. S. Mills and M. Bissel,	ib.
19. —— Flour Bolts,	Stephen C. Mendenhall,	169
20. —— Fire Pokers,	George R. Moore,	ib.
21. —— Lanterns,	Francis Morandi,	ib.
22. —— Daguerreotype Cases,	Samuel Peck,	ib.
23. —— Metallic Pens,	Myer Phineas,	ib.
24. —— Oscillating Engines,	Juan Pattison,	ib.
25. —— Harvesters,	B. F. Ray,	ib.
26. —— Saw Mills,	John S. Snider,	ib.
27. —— Sewing Machines,	Alfred Swingle, ass'd to E. Townsend,	170
28. —— Constructing Iron Buildings,	H. V. Terry, ad'rx of W. D. Terry,	ib.
29. —— Alarm Locks,	S. J. Frank,	ib.
30. —— Making Wrought Iron Shafts,	Otis Turfts,	ib.
31. —— Softening Leather,	John B. Wentworth,	ib.
32. —— Grain and Grass Harvesters, 33. —— Belt Fastenings,	Abner Whitely,	ib.
34. —— Calico Printing Machines,	J. Standing, ass'd to self & J. Barandale,	ib.
35. —— Breech Loading Cannon,	C. C. Terrel, ass'd to self & S. Crawford,	ib.
36. —— Attaching Soles to boots & shoes,	J. W. Wimley, ass'd to self and W. H. Penrose,	171
37. —— Writing Desks,	C. H. Bergmann,	ib.
38. —— Cutting Sand Paper,	William Adamson,	ib.
39. —— Scissors,	John Allender,	ib.
40. —— Grooving Tapering Boards,	B. J. Barber,	ib.
41. —— Wrench,	William Baxter,	ib.
42. —— Power Looms,	Erastus B Bigelow,	ib.
43. —— Boring and Turning Wood,	Felix and Adolph Brown,	ib.
44. —— Ploughs,	John Clark and G. W. N. Yost,	ib.
45. —— Valves, &c., of Steam Engines,	Charles W. Copeland,	ib.
46. —— Signals for Vessels,	W. P. Craig and W. R. Righter,	172
47. —— Feed Gates for Mills, &c.,	Clement Dare,	ib.
48. —— Rotary Planer for Felloes,	C. H. Denison,	ib.
49. —— Oil Cans,	Levi S. Enos,	ib.
50. —— Removing Incrustations of Boiler,	W. E. Everett and M. M. Thompson,	ib.
51. —— Adjustable Carriage Seat,	David N. Flanders,	ib.
52. —— Railroad Car Axle,	P. G. Gardiner,	ib.
53. —— Gas & Steam Cooking Apparatus,	John S. Gallaher, Jr.,	ib.
54. —— Sticking Pins in Paper,	Thaddeus Fowler,	ib.
55. —— Seed Planters,	Robert and William Gebby,	ib.
56. —— Lubricator,	William Gee,	173

57.	Improvement in Power Looms,	Elijah Hall,	173
58.	—— Stamping Letters, &c.,	Anson Hatch,	ib
59.	—— Condensing Steam Engines,	Birdsill Holly,	ib.
60.	—— Cotton Seed Planters,	J. L. Horn,	ib.
61.	—— Adjusting Circular Saws,	Westel W. Hurlbut,	ib.
62.	—— Elevator for Puddlers' Balls,	Solon S. Jackman,	ib.
63.	—— Wrench,	Ferdinand Keehnold,	ib.
64.	—— Steam Condensers,	James T. King,	ib.
65.	—— Sealing Preserve Cans,	R. W. Lewis,	174
66.	—— Porte-Monnaies,	C. Lindner and C. Hoffmann,	ib.
67.	—— Diaphragm Pump,	J. L. McPherson and J. O. Joyce,	ib.
68.	—— Wick Holders,	E. Moellen,	ib.
69.	—— Wrench,	Elisha P. Newton,	ib.
70.	—— Grain Harvesters,	Job Phillips,	ib.
71.	—— Ships' Compasses,	John Prime,	ib.
72.	—— Extinguishing Fires,	Lea Pusey,	ib.
73.	—— Breech Loading Fire Arms,	W. H. Robertson and G. W. Simpson,	ib.
74.	—— Cultivator Teeth,	C. H. Sayre and G. Klink,	ib.
75.	—— Envelopes for Bottles,	John Luther,	175
76.	—— Safety Spring Coupling,	Edwin F. Shoenberger,	ib.
77.	—— Fluing Blast Furnaces,	Christian Skink,	ib.
78.	—— Bolt Machine,	Timothy F. Taft,	ib.
79.	—— Grating Green Corn,	Benjamin Taylor,	ib.
80.	—— Folding Paper,	Thomas Thompson,	ib.
81.	—— Oil Box for Axles,	William D. Titus,	ib.
82.	—— Clothes' Clamps,	William H. Towers,	ib.
83.	—— Planing Machines,	Loison D. Towne,	ib.
84.	—— Railroad Switch,	James Whitcomb,	ib.
85.	—— Railroad Car Couplings,	S. W. Wood,	ib.
86.	—— Grain and Grass Harvesters,	George W. N. Yost,	176
87.	—— Construction of Mastic Roofing,	C. C. Hoff, ass'd to E. P. Russell,	ib.
88.	—— Concaving Circular Saws,	James M. Kern,	ib.
89.	—— Pegging Boots and Shoes,	A. Swingle, ass'd to Elmer Townsend,	ib.
90.	—— Potato Planters,	C. Morgan, ass'd to Samuel Emlen,	ib.
91.	—— Caldrons,	Henry Neusham,	ib.
92.	—— Rollers of Planing Machines,	C. Burleigh, ass'd to the P. M. Co.,	ib.
93.	—— Sowing Seed Broad-cast,	Edward H. Berry,	229
94.	—— Forks,	Sherburne C. Blodgett,	ib.
95.	—— Fountain Pen,	H. A. Brown and James Wiley,	ib.
96.	—— Sawing Marble,	Wallis and George Bull,	ib.
97.	—— Cooking Stoves,	Abner Burnham,	ib.
98.	—— Rolling Metal,	G. H. Corliss and E. Harris,	ib.
99.	—— Forging Thimbles,		
100.	—— Vault Covers,	John B. Cornell,	ib.
101.	—— Grapple for Raising Stone,	Marcus M. Cass and L. R. Bigelow,	230
102.	—— Sewing Guides,	Seth P. Chapin,	ib
103.	—— Seeding Machines,	Stephen Gorsuch,	ib.
104.	—— Power Looms,	John Johnson,	ib.
105.	—— Flexible Pen-holder,	Francis J. Klein,	ib.
106.	—— Mole of Draining Ploughs,	A. E. & C. Marquiss & C. Emerson,	ib.
107.	—— Ploughs,	James B. Mell,	ib.
108.	—— Tenoning Window Blinds,	John H. Palmer,	ib.
109.	—— Billiard Table Cushions,	Michael Phelan,	ib.
110.	—— Applying Shafts to Axles,	Charles S. Pitman,	ib.
111.	—— Temples for Looms,	Rensselaer Reynolds,	231
112.	—— Construction of Pessaries,	F. Roesler,	ib.
113.	—— Hubs for Carriages,	Joseph Smith,	ib.
114.	—— Printing from Engraved Plates,	James F. Starrett,	ib.
115.	—— Sawing Marble,	P. Schrag & W. J. Von Kammerhueber,	ib.
116.	—— Preparing Preserved Vegetables,	Masa B. Southwick,	ib.
117.	—— Heating Slugs for Hatters, &c.,	Russell Wildeman,	232
118.	—— Stave Machine,	G. W. Livermore, ass'd to L. M. Co.,	ib.
119.	—— Photographic Pictures,	H. L. Smith, ass'd to W. & P. Neff, Jr.,	ib.

120.	Improvement in Depositing Coal, &c.,	William Bell,	232
121.	—— Pitman,	Andrew Blaikie and Walter Clark,	ib.
122.	—— Edging Wall Paper,	H. J. Brunner,	ib.
123.	—— Wagons,	Benjamin B. Bundy,	ib.
124.	—— Mill Saw,	Nathan T. Coffin,	ib.
125.	—— Combined Knife & Pencil Case,	Richard Cross,	ib.
126.	—— Dove-Tailing Machine,	Ari and Asahel Davis,	ib.
127.	—— Making Shirt Collars,	Othniel W. Edson,	233
128.	—— Churns,	John W. Fiester,	ib.
129.	—— Carriage Hubs,	A. C. Garratt,	ib.
130.	—— Joints of Felloes,	S. A. Garrison and D. C. Morey,	ib.
131.	—— Steam Heating Apparatus,	Stephen J. Gold,	ib.
132.	—— Girders for Bridges,	Peter C. Guiou,	ib.
133.	—— Arched Trussed Bridges,	Horace L. Harvey,	ib.
134.	—— Projectiles,	Charles T. James,	ib.
135.	—— Separating Precious Metals, &c.,	Edward N. Kent,	ib.
136.	—— Lamps,	W. M. Kimball,	234
137.	—— Domestic Steam Generators,	James T. King,	ib.
138.	—— Percussion Locks for Fire Arms,	J. H. B. Latrobe,	ib.
139.	—— Varnishing Woven Wire,	William Lincoln,	ib.
140.	—— Horse Rakes,	Nathan Martz,	ib.
141.	—— Binding Guides,	James S. M'Curdy,	ib.
142.	—— Constructing Walls of Cellars,	A. R. Moen,	ib.
143.	—— Sewing Machines,	T. J. W. Robertson,	ib.
144.	—— Apparatus for Heating by Gas,	W. F. Shaw,	ib.
145.	—— Door Spring,	D. G. Smith,	ib.
146.	—— Boring Machine,	James Temple,	ib.
147.	—— Velocimeters for Vessels,	Ira F. Thompson,	ib.
148.	—— Measuring Braces in Carpentry,	Herman Whipple,	235
149.	—— Hardening Hats,	R. Wildman,	ib.
150.	—— Excluding Dust from R.R. Cars,	Joseph Wood,	ib.
151.	—— Bending Sheet Metal,	J. Wright,	ib.
152.	—— Cultivating Ploughs,	William C. Wyche,	ib.
153.	—— Coffee Pots,	Jacob M. Webb,	ib.
154.	—— Wheelwright Machine,	C. H. Gaurd, ass'd to self & J. A. Scroggs,	ib.
155.	—— Valves for Steam Engines,	J. Scheitlin, ass'd to self & O. Dailey,	ib.
156.	—— Sawing Machine,	W. J. Wood, ass'd to self and J. S. Gallaher, Jr.,	ib.

ADDITIONAL IMPROVEMENTS.

1.	Improvement in Hydraulic Heaters,	L. W. Leeds, and R. M. Smith,	235
2.	—— Ornamental Felt Cloth,	O. B. Tomlinson,	ib.
3.	—— Candlesticks,	Abner Whitely,	236
4.	—— Daguerreotype Cases,	John F. Mascher,	ib.
5.	—— Grinding Mills,	Amory Felton,	ib.

RE-ISSUES.

1.	Improvement in Grooving Machine,	Charles W. Brown,	236
2.	—— Polishing Stone, Metals, &c.,	A. Broughton,	ib.
3.	—— Spike Machines,	Ammi M. George,	ib.
4.	—— Sewing, &c., Straight Seams,	I. M. Singer and E. Clark, ass'd to J. J. Greenough,	ib.
5.	—— Ticket Register for R.R. Cars, &c.,	William Apperly,	ib.
6.	—— Harvesting Machines,	J. H. Manny, ass'd to P. H. Watson,	237
7.	—— Sewing Machines,	W. H. Johnson,	ib.
8.	—— Spark and Gas Consumers,	David Matthew,	ib.

DESIGNS.

1.	For Gates,	H. E. Wesche, ass'd to R. Wood,	237
2.	—— Printing Type,	Lawrence Johnson,	ib.
3.	—— Moulded Bricks,	James M. Thompson,	ib.
4.	—— Gates,	H. E. Wesche, ass'd to R. Wood,	ib.
5.	—— Bottle Castors & Egg Cup Stands,	R. Gleason, Jr., ass'd to R. Gleason.	ib.
6.	—— Cooking Stoves,	S. Pierce, ass'd to Cox, Warren & Co.,	238

7. For Stove Plates,	.	S. Burnam, ass'd to Cox, Warren & Co.,	238
8. — Cooking Stoves,	.	S. Pierce, ass'd to do. do.	ib.
9. — Parlor Stoves,	.	William T. Coggeshall, .	ib.

March, 1856.

1. Improvement in Sweeping Streets,		Timothy Alden, . .	238
2. — Cooking with Quicklime,		W. W. Albro, .	ib.
3. — Sawing Marble in Taper Form,		Christian Amazeen, .	ib
4. — Manufacturing Hats,	.	James W. Beebee, .	ib.
5. — Corn Harvesters,	.	William M. Bonwill, .	ib.
6. — Skein for Axle Arms,	.	John M. Burke, . .	ib.
7. — Ploughs,	.	James J. Cadenhead,	ib.
8. — Shingle Machine,	.	Ransom Clifford, . .	ib.
9. — Heating of Buildings,		Robert Cornelius, .	239
10. — Hinge for Shutters,	.	Isaac Davis, . .	ib.
11. — Harvester Rakes,	.	Owen Dorsey, .	ib.
12. — Self-acting Farm Gates,		Elon Dunbar, . .	ib.
13. — Lubricator,	.	William E. Everett, .	ib.
14. — Boot Crimps,	.	George Fetter, . .	ib.
15. — Sheep Shears,	.	Luther B. Fisher, .	ib.
16. — Portable Houses,	.	Daniel Fitzgerald, . .	ib.
17. — Grating for Stoves, Furnaces, &c.,		B. F. Færing, .	ib.
18. — Riffle Boxes,	.	F. R. Ford, . .	ib.
19. — Power Looms,	.	James Greenhalgh, Sr., .	240
20. — Guard for Coal Holes,		George C. Jenks, . .	ib.
21. — Heating Buildings,	.	Charles H. Johnson, .	ib.
22. — Weighing Scales,	.	James Kelly, . .	ib.
23. — Stoves & Furnaces for R.R. Cars,		Dennis G. Littlefield, .	ib.
24. — Bench Planes,	.	Ebenezer Mathers, . .	ib.
25. — Railroad Car Seats,	.	George T. M'Laughlin, .	ib.
26. — Handle for Vise,	.	John T. Ogden, . .	241
27. — Scythe Rifles,	.	Eugene J. Post, .	ib.
28. — Bottling Fluids,	.	Alphonse Quantin, .	ib.
29. — Lamps for Burning Resin Oil,		Prentice Sargent, .	ib.
30. — Pegging Boots and Shoes,	.	George Schuh and P. L. Slayton,	ib.
31. — Attaching Hubs to Axles,		Horace B. Simonds, .	ib.
32. — Air Escapes for Pumps,	.	Hiram Smith, .	ib.
33. — Gang Ploughs,	.	Aaron and Thomas S. Smith, .	ib.
34. — Corn Shellers,	.	Jeremiah P. Smith, .	ib.
35. — Tanning Apparatus,		Abraham Steers, . .	ib.
36. — Candle Dipping Machines,	.	Vincenzo Squarza,	ib.
37. — Ships' Capstans,	.	Daniel and George Fallcot, .	242
38. — Guitars,	. .	William B. Tilton, .	ib.
39. — Adjusting Circular Saws,		Andrew L. Whitely, .	ib.
40. — Application of Soles to Boots, &c.,		S. H. Whorf and Charles Rice,	ib.
41. — Heading Bolts,	:	George Woodward, .	ib.
42. — Weighing Scale Beams,	.	William Yost, . .	ib.
43. — Construction of Grand Pianos,		Daniel F. Haasz, .	ib.
44. — Constructing Iron Pavements,		Peletiah M. Hutton, .	243
45. — Railroad Car Brakes,	.	Vincent Barnes, .	ib.
46. — Hot Blast Furnaces,		La Fayette Blair, . .	ib.
47. — Valves for Lock Gates,	.	William Butler, .	ib.
48. — Ore Washer,	.	William L. Carter, .	ib.
49. — India Rubber Belting or banding,		John H. Cheever, .	ib.
50. — Bench Clamp,	.	Clinton W. Clapp, .	ib.
51. — Washing Machines,	.	E. B. Clement and Silas G. Willie,	ib.
52. — Heating Buildings by Steam,		Charles Davenport, .	ib.
53. — Sewing Machines,	.	Henry R. David, . .	ib.
54. — Preparing Hemp and Flax,	.	Nancy Davy, executrix of E. Davy,	244
55. — Preventing Horses from Falling,		Robert D. Dwyer, .	ib.
56. — Parallel Rulers,	.	R. Eickemeyer, . .	ib.
57. — Making Candles,	.	Francois Garcin, .	ib.
58. — Spark Conductors,	.	Peter C. Guiou, . .	ib.
59. — Tanning,	. .	R. Gould, . .	ib.

60.	Improvement in Carriage Tops,	Henry Hays,	244
61.	—— Ironing Hats,	S. A. Kinsman and Samuel Field,	ib.
62.	—— Harvester Cutters,	Israel S. Love,	ib.
63.	—— Spirit Blow Pipe,	Horatio N. Macomber,	245
64.	—— Mowing Machines,	Jacob J. Mann,	ib.
65.	—— Bending Wood,	John C. Morris,	ib.
66.	—— Revolving Fire Arms,	Frederick Newbury,	ib.
67.	—— Carriage Hubs,	Henry Nycum,	ib.
68.	—— Steam Boilers,	Leonard Phleger,	ib.
69.	—— Grain and Grass Harvesters,	Benjamin T. Roney,	ib.
70.	—— Straw Cutters,	Edwin P. Russell,	ib.
71.	—— Lime Kilns,	Job Sands,	ib.
72.	—— Puddling Iron,	Richard Savary,	ib.
73.	—— Straining Mulley Saws,	Theodore Sharp,	ib.
74.	—— Heating or Cooking by Gas,	William F. Shaw,	246
75.	—— Boxes for Axles,	Alfred E. Smith,	ib.
76.	—— Mortising & Boring Machine,	George N. Sterns,	ib.
77.	—— Securing Thills to Axles,	Matthias Soverel,	ib.
78.	—— Making Extracts,	Abraham Steers,	ib.
79.	—— Slide Valves of Steam Engines,	Robert L. Stevens,	ib.
80.	—— Revolving Fire Arms,	William Mt. Storm,	ib.
81.	—— Cutting Irregular Forms,	H. D. Stover & J. W. Bicknell,	247
82.	—— Harvester Cutters,	Pliny Thayer,	ib.
83.	—— Plane Stock,	John B. Thomas,	ib.
84.	—— Wrench,	Erastus Tracy,	ib.
85.	—— Fountain Pen,	A. F. and C. M. H. Warren,	ib.
86.	—— Cutting soles of boots & shoes,	W. Wells and M. Bray,	ib.
87.	—— Dove-tailing Machine,	Edwin Wight,	ib.
88.	—— Grain and Grass Harvesters,	Abner Whitely,	248
89.	—— Faucet,	Moses Woodbury,	ib.
90.	—— Leather Splitting Machines,	E. Pratt, ass'd to self & T. P. Pingree,	ib.
91.	—— Umbrella Ribs,	C. C. Reed, ass'd to " Reinert & Schell,	ib.
92.	—— Boot & Shoe Soles,	L. Stratton ass'd to self and L. Hill,	ib.
93.	—— Sewing Machines,	W. C. Watson ass'd to I. W. Gregory,	ib.
94.	—— Boxing Carriage Wheels,	Charles Schmidt,	ib.
95.	—— Welding Steel,	Homer Anderson,	303
96.	—— Bench Plane,	Lewis C. Ashley,	ib.
97.	—— Roasting and Broiling by Gas,	James B. Blake,	ib.
98.	—— "Dumb Jockey,"	Samuel Blackwell,	ib.
99.	—— Sealing Preserve Cans,	Charles Branwhite,	ib.
100.	—— Hernial Trusses,	John Broiles,	ib.
101.	—— Grain and Grass Harvesters,	Thomas D. Burrall,	ib.
102.	—— Making Chilled Castings,	William Butler,	ib.
103.	—— Carriage Couplings,	Thomas Chope,	ib.
104.	—— Threshing Machines,	Hiram Clark,	ib.
105.	—— Mowing Machines,	Samuel Comfort,	304
106.	—— Corking Bottles,	Henry N. De Graw,	ib.
107.	—— Fire Places,	Calvin Dodge,	ib.
108.	—— Grain and Grass Harvesters,	Eliakim B. Forbush,	ib.
109.	—— Blow-off Apparatus for Steam Boilers,	Jacob Frick,	ib.
110.	—— Seeding Machines,	John German and C. B. Haigh,	ib.
111.	—— Inkstand,	R. Gleason, Jr.,	ib.
112.	—— Nut Machine,	Robert Griffiths,	ib.
113.	—— Harvester Cutters,	Horace L. Hervey,	ib.
114.	—— Mortising Tool,	A. C Hitchcock and C. H. Amidon,	ib.
115.	—— Rotary Planing Knives,	Daniel N. Hurlbut,	305
116.	—— Illuminating Gratings,	Joshua K. Ingalls,	ib.
117.	—— Transparent Window Shades,	Edward R. Kernan,	ib.
118.	—— Churns,	Lucius Leavenworth,	ib.
119.	—— Self-regulating Wind-wheel,	A. Lempche,	ib.
120.	—— Percussion Projectiles,	John Lippincott,	ib.
121.	—— Stoves,	James B. Maybury,	ib.

122.	Improvement in Felling Trees,	Ebenezer Mathers,	305
123.	—— Cone Tubes for Winding Frames,	John M'Crone,	ib.
124.	—— Making Elastic Rubber Cloth,	Richard M'Mullin,	ib.
125.	—— Seed Planters,	Elijah Morgan,	ib.
126.	—— Making Clothes Pins,	George W. Parker,	ib.
127.	—— Fire Pots for Stoves & Furnaces,	Merritt Peckham,	306
128.	—— Boxes of Railroad Car Axles,	David R. Perkinpine,	ib.
129.	—— Harness Buckles,	Nathan Post,	ib.
130.	—— Omnibus Registers,	James Rodgers.	ib.
131.	—— Sawing Marble in Taper Form,	Charles A. Shultz,	ib.
132.	—— Producing Designs on Wood,	Philip Schwickardt,	ib.
133.	—— Brasses of Connecting Rods,	John R. Sees,	ib.
134.	—— Nail Plate Feeding Machines,	John P. Sherwood,	ib.
135.	—— Sewing Machines,	Isaac M. Singer,	ib.
136.	—— Making Hat Bodies,	A. B. Taylor,	ib.
137.	—— Harness for Shoeing Horses,	William P. Thomas,	ib.
138.	—— Argand Lamps,	Isaac Van Bunschoten,	307
139.	—— Boring Machines,	Israel W. Ward,	ib.
140.	—— Suspend'g Circular Saw Spindles,	Hiram Wells,	ib.
141.	—— Carding Machines,	George Wellman,	ib.
142.	—— Spinning Wheels,	Lyman Wight,	ib.
143.	—— Tunneling Rocks,	Charles Wilson,	ib.
144.	—— Harnesses & Thills of Vehicles,	Jas. H. Wilson, Jr.,	308
145.	—— Adjusting Reciprocating Saws,	J. Z. A. Wagner,	ib.
146.	—— Cut-off Gear for Steam Engines,	O. Leonard, ass'd to self & G.H.Reynolds,	ib.
147.	—— Propelling Vessels,	Lambert Alexander,	ib.
148.	—— Needle Guns,	G. A. Blittkowski and F. W. Hoffman,	ib.
149.	—— Detaching Boats from Tackle,	C. H. Key, adm'r. of S. F. Blunt,	ib.
150.	—— Cutting Loaf Sugar,	Adolph and Felix Brown,	ib.
151.	—— Breech Loading Fire Arms,	Ambrose E. Burnside,	ib.
152.	—— Flow of Oil in Lamps,	Abraham Coates,	309
153.	—— Presses for Pinching,	George H. Corliss and Elisha Harris,	ib.
154.	—— Fruit or Grain Dryers,	Charles W. Davis,	ib.
155.	—— Stone Drilling Machines,	Josephus Echols,	ib.
156.	—— Paddle Wheels,	Calvin Fletcher,	ib.
157.	—— Water Coolers and Filterers,	John S. Gallaher, Jr.,	ib.
158.	—— Lath Machine,	Jesse Gilman,	ib.
159.	—— Steam Radiator Cocks,	Stephen J. Gold,	ib.
160.	—— Miniature Case,	H. Halverson, ass'd to Slocum & Co.,	ib.
161.	—— Pile Driver,	J. W. Hoard,	ib.
162.	—— Explosive Shells,	William W. Hubbell,	ib.
163.	—— Fan Rocking Chairs,	Konrad Keifer,	310.
164.	—— do. do.	Benjamin M. Lewy,	ib.
165.	—— Spring Platform for R.R. Cars,	Charles H. Lewis,	ib.
166.	—— Piano-Forte Action,	N. Murphy	ib.
167.	—— Cooling & Ventilating Rooms,	A. S. Lyman,	ib.
168.	—— Carpenters' Bench,	J. W. Mahan,	ib.
169.	—— Sweeping Streets,	Joseph Miller,	ib.
170.	—— Gun Locks,	Edwin P. Monroe,	ib.
171.	—— Wardrobe Bedsteads,	Henry R. and James L. Plimpton,	ib.
172.	—— Levers of Railroad Car Brakes,	Lucius Paige,	ib.
173.	—— Oscillating Engines,	Horatio O. Perry,	ib.
174.	—— Grain Separators,	Cyrus Roberts and John Cox,	ib.
175.	—— Field Fence,	J. B. Reyman,	311
176.	—— Portable Field Fences,	James Rowe,	ib.
177.	—— Post Driver,	James M. Sampson,	ib.
178.	—— Sizing Hat Bodies,	Albert Spencer,	ib.
179.	—— Clamp for Planking Ships,	Solon Staples,	ib.
180.	—— Steam Boilers,	O. M. Stillman and S. Wilcox, Jr.,	ib.
181.	—— Syringe Bottles,	John Stull,	ib.
182.	—— Water Metre,	Andrew J. Sweeney,	ib.
183.	—— Cock for Steam, Water, &c.,	William Thomas,	ib.
184.	—— "Creepers,"	William H. Towers,	ib.

185. Improvement in Wrenches,	William Warwick,	312
186. —— Cotton Seed Planters,	A. W. Washburn,	ib.
187. —— Butter Worker,	James H. Bennett,	ib.
188. —— Self-setting Rat Trap,	Samuel Beaumont,	ib.
189. —— Sawing Marble,	John A. Bailey	ib.
190. —— Cultivating Plough,	Micajah Crenshaw,	ib.
191. —— Tools for Figuring Morocco,	Samuel Green,	ib.
192. —— Water Wheel,	John Haseltine,	ib.
193. —— Sawing Marble,	Isaac A. Heald,	ib.
194. —— Moulds for Earthen vessels, &c.,	Philip Schrag,	313
195. —— Raking and Loading Hay,	D. H. Thompson,	ib.
196. —— Cotton Hillers,	A. W. Washburn,	ib.
197. —— Cotton Scrapers,		
198. —— Grain and Grass Harvesters,	Abner Whitely,	ib.
199. —— Printing Cylinder,	Justus Webster and S. H. Folsom,	ib.
200. —— Hand Corn Planters,	William Jenks,	ib.
201. —— Ash Sifters,	Charles Jones,	ib.
202. —— Scythe Fastenings,	T. C. Ball, ass'd to N. Lamson,	ib.
203. —— Harvester Cutters,	John H. Manny, ass'd to P. H. Watson,	ib.
204. —— Cut-offs for Steam Engines,	H. S. Hopkins, ass'd to Hopkins & Co.,	ib.
205. —— Wrenches,	H. D. Walcott, ass'd to H. D. and M. E. Walcott,	314
206. —— Horse Power,	Richard Hunt,	ib.
207. —— Construction of Cisterns,	William D. Bartlett,	ib.

ADDITIONAL IMPROVEMENTS.

1. Improvement in Excavating Machines,	J. J. Savage,	314
2. —— Mash Machines,	Adolph Hammer,	ib.
3. —— Gas Burners,	Charles H. Johnson,	ib.

RE-ISSUES.

1. Improvement in Spark Arresters,	David Matthew,	314
2. —— Grain and Grass Harvesters,	Abner Whitely,	ib.
3. —— Splitting Match Splints,	B. Howard, ass'd to Lewis Smith,	ib.
4. —— Railroad Cars,	Bernard J. La Mothe,	315
5. —— Making Nuts, Washers, &c.,	W. Kenyon, ass'd to Haigh & Co.,	ib.
6. —— Forming the Web for Cloth of Wool, &c.,	Union Man. Co., ass'd to Representatives of John Arnold, deceased,	ib.
7. —— Sewing Machines,	S. S. Turner, ass'd to E. Townsend,	ib.
8. —— Working & stopping chain cables,	Thomas Brown,	ib.
9. —— Sawing Machine,	W. P. Wood, ass'd to self and others,	316

DESIGNS.

1. For Parlor Stoves,	Samuel D. Vose,	316
2. —— Handles of Forks and Spoons,	Theodore Evans,	ib.
3. —— Elevated Oven Stoves,	S. W. Gibbs, ass'd to Treadwell & Co.,	ib.

April, 1856.

1. Improvement in Self-inking Stamps,	Nathan Ames,	368
2. —— Lubricator,	Edward J. Baker,	ib.
3. —— Bench Vise,	Benjamin G. Ball,	ib.
4. —— Seamless Metal Tubes,	William F. Brooks,	ib.
5. —— Rolling Railway Bars,	John W. Brown,	ib.
6. —— Removing Grain from Harvester,	Samuel Comfort, Jr.,	ib.
7. —— Breech Loading Fire Arms,	Hezekiah Conant,	ib.
8. —— Steam Boilers,	F. P. Dimpfel,	ib.
9. —— Grain Harvesters,	Augustus Elliot,	369
10. —— Hydrant,	Henry English,	ib.
11. —— Printing Press,	George F. Folsom,	ib.
12. —— Cloths for Felting Hat Bodies,	William Fuzzard,	ib.
13. —— Journal Box for Car Axles,	William B. Gage,	ib.
14. —— Manufacturing Augers,	George G. Griswold,	ib.
15. —— Steam Whistles in Locomotives,	James Harrison, Jr.	ib.
16. —— Slide Rests,	Albert V. Hill,	ib.
17. —— Mortising Machine,	Edward Joslin,	ib.

18.	Improvement in Life Boat,	George W. La Baw,	370
19.	—— Former for Spiral Springs,	Vincent D. Lent,	ib.
20.	—— Spark Arresters,	Stimmel Lutz,	ib.
21.	—— Converting Rotary Motion,	Robert Maffitt,	ib.
22.	—— Mitering Bench,	J. W. Mahan,	ib.
23.	—— Gathering Seeds in the Fields,	Thomas E. Marable,	ib.
24.	—— Wrenches,	Philip McManus,	ib.
25.	—— Wind Wheels,	Francis Peabody,	ib.
26.	—— Soldering Wire Ferrules,	Asahel Pierpont,	ib.
27.	—— Stirring Straw & Husk Beds,	Calvin A. Richardson,	ib.
28.	—— Forge Fires,	W. Rodgers and A. Bannon,	ib.
29.	—— Feeding pump for Steam Engines,	John R. Lees,	ib.
30.	—— Wheelwright Machine,	John Silton,	371
31.	—— Lathe,	Henry C. Spaulding,	ib.
32.	—— Axle Boxes for Carriages,	Ezra M. Stratton,	ib.
33.	—— Valve Gear of Oscillat'g Engines,	William Stephens,	ib.
34.	—— Field Fence,	S. G. Turfts,	ib.
35.	—— Grain and Grass Harvesters,	George W. N. Yost,	ib.
36.	—— Door Springs,	A.Barton ass'd to self, Morgan& Parsons,	ib.
37.	—— Bridges,	G.W.O.Huggins, " Bender & Tiedman,	ib.
38.	—— Making Carpet Lining,	John R. Harrington,	372
39.	—— Skates,	Fernando Klein,	ib.
40.	—— Fishing Lead,	Wooster Smith,	ib.
41.	—— Drying Wet Grain, &c.,	Stephen V. Appleby,	ib.
42.	—— Enclos'g Propel'r Shafts in Keels,	Aaron Arnold,	ib.
43.	—— Looms,	Erastus B. Bigelow,	ib.
44.	—— Cooking Ranges,	J. Plant & Charles G. Ball,	ib.
45.	—— Waste for Hydrants,	Edward J. Baker,	373
46.	—— Pressure Bells,	Jason Barton,	ib.
47.	—— Door Fasteners,	G. H. Linder,	ib.
48.	—— Fastening Door Knobs,	Nathan Benham,	ib.
49.	—— Combing Seed off Broom Corn,	George E. Burt,	ib.
50.	—— Shot Guns,	G. Buckel and E. Dorsch,	ib.
51.	—— Magneto-Electric Machines,	Calvin Carpenter, Jr.,	ib.
52.	—— Rotary Pumps,	Thomas Crane,	ib.
53.	—— Sash Fastener,	Thomas J. Crooke,	ib.
54.	—— Tempering Furnace,	Robert B. Fellows,	ib.
55.	—— Flood Gates,	George W. Flanders,	ib.
56.	—— Vise,	Orlando V. Florey,	ib.
57.	—— Planing Felloes,	A. W. Fox,	ib.
58.	—— Piston Vavles for Boilers,	William S. Gale,	374
59.	—— Polishing Leather,	William P. Gamble,	ib.
60.	—— Carriage Couplings,	William Greenleaf,	ib.
61.	—— Submarine Lanterns,	C. M. Gould and C. B. Lamb,	ib.
62.	—— Sifting Coal and other Articles,	Samuel Harris,	ib.
63.	—— Extract'g Oil from Cotton Seed,	A.A.Noyes ass'd to Ashman & Phelps,	ib.
64.	—— Slide Valves and Operat'g them,	William N. Henderson,	ib.
65.	—— Whalebone for Whip Handles,	Liveras Hull,	ib.
66.	—— Mixing Lime, &c., for Mortar,	Henry W. Hunt and John Sands,	ib.
67.	—— Construction of Envelopes,	Robert T. Knight,	ib.
68.	—— Locks,	William Maurer,	375
69.	—— Pneumatic Valve,	E. Parker and W. Reynolds,	ib.
70.	—— Door Locks,	Andrew Patterson,	ib.
71.	—— Charring Wood,	Sandford S. Perry,	ib.
72.	—— Valve for Steam Engines,	H. H Smith,	ib.
73.	—— Paper Machines,	P. H. Wait,	ib.
74.	—— Boilers for Cooking by Steam,	Edward Whitely,	ib.
75.	—— Treating Surface Springs,	Anson Wolcott,	ib.
76.	—— Slate Frame,	Edwin Young,	ib.
77.	—— Making Envelopes,	William W. Cotton,	ib.
78.	—— Regulat'g Pumps by wind Whl's,	J. W. Goodwin and M. C. Hawkins,	376
79.	—— Valves for Hydraulic Engines,	John D. Heaton,	ib.

80.	Improvement in Basin Cocks,	Charles Harrison,	376
81.	—— Sowing Seed Broadcast,	Jesse Lincoln,	ib.
82.	—— Corn Planters,	Edward P. Lacey,	ib.
83.	—— Polishing Buckles,	Robert G. Pine,	ib.
84.	—— Spoke Shave,	Martin Snow,	ib.
85.	—— Bending Wood,	Edward J. Updegraff,	ib.
86.	—— Core Bar for Pipe Moulding,	J. Demarest, ass'd to the J.L.Mott I. W.	ib.
87.	—— Wash-Boards,	R. Hatch, ass'd to H. C. Hatch,	ib.
88.	—— Boxes for Axles,	J. Bevin, ass'd to self & S. N. Stillman,	377
89.	—— Railroad Car Brakes,	R. M. Evans, " " & C. S. Gale,	ib.
90.	—— Oil Cans,	T. Priestly, ass'd to D. Holden,	ib.
91.	—— Heating & Ventilat'g Buildings,	J. Sawyer, ass'd to self & T. Hale,	ib.
92.	—— Making Envelopes,	William H. Lowe,	ib.
93.	—— Power Looms,	Andrew Allen,	ib.
94.	—— Calender Clocks,	Edwin Allen,	ib.
95.	—— Raising Water for Cattle,	J. A. Ayres,	ib.
96.	—— Blocks of Lasts,	Andrew J. Barnhart,	ib.
97.	—— Coal Stoves,	W. W. Binney,	ib.
98.	—— Cut-off Valves for S. Engines,	Henry E. Canfield,	378
99.	—— Grates & Damp'rs for Chimn'ys,	Jacob Cohen,	ib.
100.	—— Stump Extractor,	J. B. Creighton,	ib.
101.	—— Omnibus Registers,	Levi Cromwell,	ib.
102.	—— Lock Hasp,	M. Newman,	ib.
103.	—— Churns,	William Newbrough,	ib.
104.	—— Wheel Hub,	Joseph Summers,	ib.
105.	—— Photographic Impressions,	Joel H. Tatum,	ib.
106.	—— Vault Covers,	William D. Titus,	ib.
107.	—— Railroad Brakes,	Benjamin T. Trimmer,	ib.
108.	—— Electro-magnetic Engines,	Maurice Vergnes,	ib.
109.	—— Wigs,	DeWitt C. Warner,	379
110.	—— Stone and Marble Saw,	H. H. Whitey and E. A. Gray,	ib.
111.	—— Door Spring,	Gilbert L. Bailey,	ib.
112.	—— Grain Weighing Machines,	William H. Bramble,	ib.
113.	—— Sawing Marble Obelisks,	Lebbius Brookes,	ib.
114.	—— Farm Gates,	J. Francis Downing,	ib.
115.	—— Air Engines,	John Ericsson,	ib.
116.	—— Thills & Poles to Vehicles,	Abram J. Gibson,	ib.
117.	—— Protecting Vines,	Abel H. Grennel,	ib.
118.	—— Musquito Nets,	Samuel E. Hartwell,	ib.
119.	—— Straining Marble Saws,	William B. Hatch,	380
120.	—— India-rubber,	Nathaniel Hayward,	ib.
121.	—— Saw'g Marble in Obelisk form,	J. E. Haviland,	ib.
122.	—— Stretching Cloth,	Jonathan J. Hillard,	ib.
123.	—— Bedstead Fastenings,	William Hinman,	ib.
124.	—— Grain and Grass Harvesters,	William H. Hovey,	ib.
125.	—— Candle Cutting Apparatus,	John Jones,	ib.
126.	—— Hay and Cotton Presses,	Simon Ingersoll,	ib.
127.	—— Railroad Cars,	J. Kline, Jr. and S. V. Kline,	ib.
128.	—— Hoisting Drums,	George W. La Baw,	ib.
129.	—— Fire Arms,	Palmey Lancaster,	ib.
130.	—— Metallic Bedsteads,	Marshal Lefferts,	381
131.	—— Whip Sockets,	William H. Lyman,	ib.
132.	—— Stereoscope Case,	William Loyd,	ib.
133.	—— Hoisting Coal,	George Martz,	ib.
134.	—— Reversible Backs of Settees,	B. F. M'Creary,	ib.
135.	—— Reaping Rice,	W. J. M'Intosh,	ib.
136.	—— Feeding Furnaces with Fuel,	Alexander M. Sprague,	ib.
137.	—— Water Metre,	R. L. Hawes,	ib.
138.	—— Electric Telegraph,	Charles Kirchof,	ib.
139.	—— Harvester Raking Attachments,	William H. Hovey,	382
140.	—— Grain and Grass Harvesters,	William A. Kirby,	ib.
141.	—— Repairing Railroad Bars,	James M'Lellan,	ib.
142.	—— Brass Kettles,	O. W. Minard,	ib.

143.	Improvement in Folding Paper,	John North,	382
144.	—— Leather Straps, &c.,	George W. Pruyne,	ib.
145.	—— Cut-offs for Steam Engines,	John S. Shapter,	ib.
146.	—— Saw Mills,	E. H. Stearns,	383
147.	—— Puddle Ball Squeezer,	Shubeal Wilder,	ib.
148.	—— Weighing Scales,	R. F. Wolcott,	ib.
149.	—— Seeding Machines,	T. A. Risher, ass'd to self & J. R. Cooper,	ib.
150.	—— Awl Haft,	B. James, ass'd to Roswell E. James,	ib.
151.	—— Adjusting Circular Saws,	J.M. Kern ass'd to E. P. Fitch & I. Scott,	ib.
152.	—— Fishing Tackle,	Julio T. Buel,	ib.
153.	—— Seeding Machines,	George A. Bitler,	ib.
154.	—— Sowing Fertilizers,	Warren S. Bartle,	ib.
155.	—— Valves for Steam Engines,	Alexander Buchanan,	384
156.	—— Brick Machines,	Patrick S. Devlan,	ib.
157.	—— Cultivators,	George Esterly,	ib.
158.	—— Digging Peat,	Abraham Fitts,	ib.
159.	—— Revolving Fire Arms,	G. A. Blittkowski & F. W. Hoffman,	ib.
160.	—— Magnets for Telegraphs,	Andrew Coleman,	ib.
161.	—— Waste Device for Hydrants,	John Calver,	ib.
162.	—— Door Locks,	John B. Erb,	ib.
163.	—— Sugar Evaporators,	Samuel H. Gilman,	ib.
164.	—— Driving Spokes,	C. Haas and J. C. Noll,	385
165.	—— Hotel Annunciators,	William H. Hale,	ib.
166.	—— Cooking Stoves,	William E. Hays,	ib.
167.	—— Steam Boilers,	C. B. Hoard,	ib.
168.	—— Phosphoric Acid,	Eben N. Horsford,	ib.
169.	—— Suspending Top-sail Yards,	George Hubbard,	ib.
170.	—— Flasks for Moulding,	James J. Johnson,	ib.
171.	—— Electro-magnetic Telegraphs,	Albert J. Partridge,	ib.
172.	—— Coal Breakers,	Thomas Petherick,	ib.
173.	—— Grain Scales,	Nathan M. Phillips,	ib.
174.	—— Measuring Faucet,	Edwin A. Palmer,	ib.
175.	—— Carriage Tops,	Alanson Quigley,	ib.
176.	—— Cast Iron Pavements,	Asa P. Robinson,	386
177.	—— Gas Burners,	William F. Shaw,	ib.
178.	—— Working Sheet Metal	S. R. Shepard and O. W. Stow,	ib.
179.	—— Preventing Nocturnal Emiss'ns	L. D. Sibley,	ib.
180.	—— Conical Tent,	H. H. Sibley,	ib.
181.	—— Fastening Lamps to Lanterns,	E. Sirret and W. H. Scott,	ib.
182.	—— Fire Arms,	Thomas Smith,	ib.
183.	—— Steam Heating Boilers,	George S. G. Spence,	ib.
184.	—— Locks, &c., for Windows, &c.	Alfred Spear,	ib.
185.	—— Cotton Cleaners,	J. H. Kinyon & J. Hollingsworth,	ib.
186.	—— Sub-soil Ploughs,	Pells Manny,	387
187.	—— Vapor Lamps,	Alonzo M. Mace,	ib.
188.	—— Sawing Marble,	James Miller,	ib.
189.	—— Corn Harvesters,	R. C. Mauck,	ib.
190.	—— Corn Shellers,	A. H. Stevens,	ib.
191.	—— Railroad Cars,	Richard Vose,	ib.
192.	—— Coffee Pots,	C. B. Waite and J. W. Senar,	ib.
193.	—— Bearings for Horse Powers,	T. D. Burk, ass'd to Miller & Fowler,	ib.
194.	—— Wire Fences,	T. D. Burk, ass'd to J. Garrett,	ib.
195.	—— Auger,	K. Curtis, ass'd to Winsted Auger Co.	ib.
196.	—— Direct Acting Engines,	Henry R. Worthington,	ib.
197.	—— Hoop Machine,	G. W. Holmes, ass'd to J. C. Marble,	388
198.	—— Shovel and Tongs,	S. Huffman, ass'd to self and J.D. Brown,	ib.
199.	—— Tunneling and Quarrying,	I. Merrill, ass'd to self & A. Maxwell,	ib.
200.	—— Wearing Apparel,	L. Paige, ass'd to self & A. L. Lincoln,	ib.
201.	—— Weaving Bags,	Samuel P. Thomas,	ib.

Accident—Notice of the Aberdeen Railway . . . 69
Adriatic—Particulars of the U. S. Steamer . . . 391
Air Pump—Notice of Laing's Improved . . . 55
Algea, &c., in the Manufacture of Soaps On Employing of . . 207
Allen, (C. J.) on the Theory of the Gyroscope, . . 394
Aluminum—History and Properties of . . . 65
———On the Alloys of Iron and . . . 121
———Process for obtaining . . . 27
———Preparation of . . . 195
America—Particulars of the Steamer . . . 70
ntelopé— do. do. . . . 35
Anti-Friction Bearings—Report on G. T. Parry's . . 284
Artillery and Projectiles—On . . . 55, 207
Astronomical Expidition to the Southern Hemisphere—Notice of Lieut. Gilles' Report on the U. S. . . . 143
———Observatory on the Mountain Augustus Mullay—On the establishment of a Magnetical, Meteorological, and . . 62
Atmosphere during the Cholera—On the Condition of the . 202
Atmospheric Electricity by the Photo-Barograph and Thermograph—On the Detection and Measurement of . . 62
Atrato—Comparative results obtained from the Screw and Paddle-wheel in the Steamships Himalaya and . . . 77
Aurora Borealis—On the 61

Bakewell, (T. W.)—On the Open Polar Sea, . . 257
Bells—Experiments on Sound for the Application of Ringing . . 260
Bibliographical Notices.
U. S. Naval Astronomical Expedition to the Southern Hemisphere. By Lieut. J. M. Gillis, ... 143
Polar Sea—Solar Heat Theory. By S. Hollingsworth, . 144
Treatise on Plane and Spherical Trigonometry. By W. Chauvenet, . 288
Great Circle Protractor. By W. Chauvenet, 288
Binary Star, 70 Ophiuchi—On certain Anomalies presented by the . 61
Binocular Vision of Surfaces of different Colors, . . 59
Boiler Explosions—Report on Steam . . . 54
———On the Causes of Steam . . . 296
Bread—On the Composition of . . . 122
Bricks and Coping Stones—Moulding Slag . . 410
British Association for the Advancement of Science—Objects of the . 53
Buoys, Beacons, and other stationary floating bodies—On the Construction of 79
Boiler—On the Evaporative efficiency of Martin's Tubular . . 357

Canadian—Particulars of the Steamer . . . 279
Canal—Steam on the Preston and Kendall . . 159
———through the Isthmus of Suez, . . 150, 367
Carvings—Specimens of Amies' Imitation of Wood . . 72
Castings—New Ornamental 278
Castor Oil as a Mechanical Lubricant, . . . 71
Cholera—On the Condition of the Atmosphere during the . . 202
Coal Mines—On the relation between Revolving Storms and the Explosions in 207
Coating for Walls—On a New 116
Cog Wheels—Description of a Machine for Moulding . . 45
Colors—On the Binocular Vision of surfaces of different . . 59
Compasses—Description of Gover's Indicating . . 267
Condensing Steam by the Hot-water System after it has been applied as a Motive Power—Prosser's Method of . . . 343
Connecting Rods of Steam Engines—On Measuring the length of . 125
Copper and Zinc—Statistics of . . . 69
Corn Planters—Wakefield's 44
——— Malone's, ... 138
Corn, Sugar Cane, and Cotton Bushes—Description of Coates's Machine for cutting Hemp, ... 401
Cosmorama Stereoscope, ... 280

Couplings for Cars—On Hopkin's Self-acting and other . 85
————Screw-shaft Propellers, . . . 22
Cultivator—Description of Johnson's Rotary 140
Curvatures on Railways—Experiments to Ascertain the effects of Grades and 289

Draining of the Haarlem Lake—On the . . . 227

East Indian Iron—Manufacture of 132
Edinburgh—Particulars of the Steamer 332
Electricity by the Photo-barograph and Thermometer—On the Detection and Measurement of Atmospheric . . . 62
————On the Manufacture of Steel by . . . 248
Electro-chemical Engraving, . . . 115
Engraving—Process for Heliographic . . . 195
————The Photo-galvanic Process of . . 412
Ether Engines—De Tremblay's Steam and . . . 40
Etna—Particulars of the Steamer . . . 343
Excavations and Embankments—Method of Calculating . . 1
Explosions in Coal Mines—On the relation between Revolving Storms and 207
————of Steam Boilers—On the Causes of . . 296
————Report on Steam Boiler . . . 54

Farm Implements—Mechanical Engineering as applied to 41, 138, 186, 258, 401
Flouring Mills—Description of Weiss & Ran's Portable . 258
Force Pump—Description of Aytoun's Double-acting . . 32, 333
Franklin—Particulars of the Steam Barge . . 63
Friction Bearings—Report on Parry's Anti- . . 284
Fulton—Particulars of the Steamer . . . 36, 339
Furnaces—On Gas . . . 269, 326
Fire Alarm Telegraph—Description of the Philadelphia Police and . 416

FRANKLIN INSTITUTE.

Proceedings of Meetings, . . 71, 141, 215, 286, 358, 415

Committee on Science and the Arts.

Proceedings of Meeting, ... 418
Report on J. D. Dale's Machine for working Wood Mouldings, . 281
————G. T. Parry's Anti-Friction Bearings, . . 284
————W. Chauvenet's Great Circle Protractor, . . 418
————H. Whitall's Movable Planisphere, . . . 420

Galvanographic process of Engraving—The Photo- . . 412
Gas—Description of Dimsdale's patent for the Manufacture of . 25
——Engine—Notes on the Ignition . . 388
——Furnaces—C. Schinz's remarks and description of . 269, 326
——used in Chemical Laboratories—Description of Markin's Apparatus for regulating the pressure of 392
Geologists and Miners, called a "Metra"—Description of an Instrument for 74
Girders and Tubes—On the relative proportions of the Top, Bottom, and Middle Web of Iron 365
Glaciers—On the Descent of the 211
Glycerine—Process for Obtaining and Purifying . . 122
Grades and Curvatures on Railways—Experiments to ascertain the effects of 289
Grate Bars—Interfering patents— Schlough *vs.* Vansyckel's . 104
Great Circle Protractor—Notice of Prof. Chauvenet's . 288, 418
Grooves—Description of a Circular Saw for cutting . . 190
Gulf Stream—Some remarks on the . . . 144
Gun—Failure of the Nasmyth 64
Gutta-Percha and India Rubber—On the *Hancornia Speciosa*, artificial 206
Gyroscope—Explanation of the Theory of the . . 394

Haarlem Lake—On the Draining of the . . . 227
Haswell, (C. H.) on the manner of Steering Steamers, and on Athwartship Bulkheads, ... 256
Haymaking Machines, ... 42
Heat of Vapors—Note on the Latent . . 407
Heliographic Engraving—Process of . . . 195
Hemp, Corn, Sugar Cane, and Cotton Bushes—Description of Coates's Machine for cutting 401
Himalaya and Atrato—Comparative results obtained from the Screw and Paddle-wheel in the Steamships 77
Howson (H.) Description of Circular Saw for cutting Grooves, . 190
———— Interfering Patent Case—Schlough *vs.* Vansyckel's Grate Bars, 104
———— Mechanical Engineering as applied to Farm Implements, 41, 138, 186, 258, 401

Ignition Gas Engine—Notes on the . . . 388
India Rubber—On the *Hancornia Speciosa*—artificial Gutta-Percha and . 206
Interference Apparatus and its uses—Description of a New . 408
Iron and Aluminum—On the Alloys of . . . 121
—— Girders and Tubes—On the relative proportions of the Top, Bottom, and Middle Web of 365
—— Lighthouses; with a description of the Coffin's Patches Light—History and Construction of 145
—— Manufacture of East Indian . . . 132
—— of the Mersey Shore—On the Titaniferous . 121
—— Plates—Report on the Strength of . . . 54
—— Ship Building—Remarks on . . . 124
—— Ships—On the Construction and Advantages of . . 122
—— Steamboat—Particulars of an . . . 34
—— Steamer do. do. . . . 33
———— Jefferson Davis—Particulars of the . . 411
Isthmus of Suez—Canal across the . . 150, 367

James A. Requa—Particulars of the Steamer . . 333
Jamin, (J.)—Description of a new Interference Apparatus, and its uses, . 408
Jefferson Davis—Particulars of the Iron Steamer . . 411

Latent Heat of Vapors—Note on the . . . 407
Leaden Pipes in the Supply of Water and Beer, . . 412
Lewiston—Particulars of the Steamer . . . 342
Lighthouses; with a description of the Coffin's Patches Light—On the History and Construction of Iron . . . 145
Lights—Description of a new Reflector for . . 84
Locomotives—Law Report of Patent Case, Winans *vs.* N. York and Harlem Railroad Co.—Eight-wheel . . . 316
Lubricant—On the use of Castor Oil as a Mechanical . . 71

Magnetic Gauge for Steam Boilers, . . . 210
———— Meteorological and Astronomical Observatory on the Mountain of Augustus Mullay—On the establishment of a . 62
Marine Engines—On working Steam Expansively in 132, 196, 250, 334, 397
Martin's Vertical Tubular Boilers—On the Evaporative Efficiency of . 357
Mayer, (F. F.) Description of Martin's Apparatus for regulating the pressure of Gas used in Chemical Laboratories, . 392
Merrick, (J. V.) On the History and Construction of Iron Lighthouses; with a description of the Coffin's Patches Light, . 145
———— On the Evaporative Efficiency of Martin's Tubular Boiler, 357
Merrimac—Trial trip of the U. S. Steam Frigate . . 274
Metallic Plates—Indestructible Printing on . . . 409
———— Silicates at high temperatures—On the Action of Sulphurets on 121
Meteorology of the United States and Canada—On the . . 117
Metra—Description of a new Instrument for Geologists and Miners called a . 75

Mouldings—Report on J. D. Dale's Machine for working Wood . 281
Momentum Engine for Steam or Water—On a . . . 207
Morning Star—Particulars of the Steamboat . . 193
Mineral Statistics of Great Britain, . . . 69

Nasmyth Gun—Failure of the . . . 64
Nature Painting—Notice and Description of . . . 37
Newton's Rings on the Surface of Water—Process for forming . 194
Niagara—Particulars of the U. S. Steam Frigate . 191
Nystrom, (J. W.) Experiments on Sound for the Application of Ringing Bells, 260

Oils in Painting—Peculiar Reaction of Essential . . 112
Optical Apparatus and its uses—Description of a New . . 408
Orchestrina—Notice of Zimmerman's New Musical Instrument, . 72
Oxygenation—Note on various Phenomena of . . 111

Paddle-wheel in the Steamships Himalaya and Atrato—Comparative results obtained from the Screw and . . . 77
Painting—Peculiar Reaction of Essential Oils in . . 111
Panama Railroad—Notice of the . . . 4
Paper Pulp—On Papyrus Bonaparte, &c., which furnish Fibre for 204
Patent Law Reports,
Action of Interfering Patents Co.—Schlough *vs.* Vansyckel—Grate Bars, . 104
McCormick *vs.* Manny—Reaper Case, . . . 176
Winans *vs.* New York and Harlem Railroad—Eight-wheel Locomotive Case, 316
Patent Laws—On the operation of the English . . . 55
Persia—Notice of the Launch of the Cunard Steamer . . 66
———Particulars of the Steamer, . . . 192
Photographs, by Dr. Langdell—Notice of . . . 287
Photo-galvanic Process of Engraving, . . . 412
Pipes in the Supply of Water and Beer—Leaden . . 412
Planisphere—Report on Whitall's Movable . . 420
Poisoning by Paint, demonstrated Experimentally, . . 194
Polar Open Sea—T. W. Bakewell on the . . . 257
———— With some Remarks upon the Gulf Stream. By S. Hollingsworth—Polar Sea Solar Heat Theory; an attempt to solve the Problem of a . . . 144
Polarity of Diamagnetic Bodies—Experimental Demonstration of the . 59
Police and Fire Alarm Telegraph—Description of the Philadelphia . 416
Potato Planter—Description of Morgan's . . . 187
Powhatan—Reply to Remarks in the Nautical Magazine—Performance of the U. S. Steamer, ... 256
Printing—Notice and Description of Nature . . . 37
——— On Metallic Plates—Indestructible . . 409
Projectiles—On Artillery and . . . 55, 207
Propeller Shafts—Couplings for 22
———— Wood Bearings for 364
Prosser, (T.)—On a new Method of Applying the Power of Steam and of Condensing the same after it has been so applied, . 343
Pump—Description of Aytoun's Double-acting Force . 32, 333
———— Weis and Ran's Farm . . 189

Railroad Company—Extract from the Report of the Texas Western . 73
——— Notice of the Panama . . . 4
Railway Accident—Notice of the Aberdeen . . . 69
——— Trains over Mont Cenis—Method of Carrying . 158
Railways and Telegraphs of Great Britain—On the . . 217
——— Experiments to Ascertain the effects of Grades and Curvatures on 289
Rain Falls at Home and in Foreign Countries—Notice of . . 120
Rattle for Policemen—Notice of M'Cord's, . . . 287

Reaper Case—McCormick *vs.* Manny—Patent Law Report . . 176
Reflector for Lights—Description of a new 84
Rule—Description of a new Parallel and Radial 208

Saw for Cutting Grooves—Description of a Circular . . 190
Schinz, (C.) On Gas Furnaces 269, 326
Screw and Paddle Wheel in the Steamships Himalaya and Atrato—Comparative Results obtained from the 77
——— Propeller Shafts—Couplings for 22
——————— Wood Bearings for 364
——— Propellers at Different Velocities and Depths—On the Effects of 207
Ship Building—Remarks on Iron 124
Ships—On the Construction and Advantages of Iron . . . 122
Signals—On the Transmission of Time 54
Simonson, (G. A.) Method of Calculating Excavations and Embankments, 1
Slag Bricks and Coping Stones—Moulding . . . 410
Smith, (E. W.) Notice of the U. S. Steamer Fulton, . . . 339
Smoke—On the Consumption of 126
——— Question—Remarks on the 67, 113, 126
Snow—Experiments on the Quantity of Water Contained in . . 195
Soaps—On the Employment of Algea, &c., in the Manufacture of . 207
Sodium and its Manufacture, ... 39, 415
Solar Heat Theory—An Attempt to Solve the Problem of an open Polar Sea 144
Sound for the Application of Ringing Bells—Experiments on . . 260
Speaking Tubes—Notice of Woodcock & Astrander's . . 286
Stains of Nitrate of Silver—Removal of 24
Star 70 Ophiuchi—On certain Anomalies Presented by the Binary . 61
Statistics of Copper and Zinc, and of the Minerals of Great Britain, . 69
Steam and Ether Engines—De Trembley's 40
——————— of Condensing the same—Prosser's new Method of Applying the Power of 343
——— Boats—Particulars of
an Iron 34—Franklin 53—Morning Star . 193
——————— Notice of Tubular Boilers for Western . . 393
——— Boiler Explosions—Report on 54
——— Boilers—Bellhouse & Cowburn's Oscillating Safety-Valve for . 23
——————— Magnetic Gauge for 210
——————— Merrick on the Evaporative Efficiency of Martin's Tubular 357
——————— On the Causes of Explosions of . . . 296
——— Engines—Application of Volute Springs to the Safety Valves of 155
——————— Description of a new Expansive Valve Motion for . 361
——————— On Measuring the Length of Connecting rods of . 125
——— Expansively in Marine Engines—On Working 132, 196, 250, 334, 397
——— Frigate Merrimac—Trial Trip of the United States . 274
——————— Niagara—Particulars of the United States . . 191
——— On the Preston and Kendall Canal . . . 159
——— Or Water—On a Momentum Engine for . . . 207
——— Tug Boat for Lake Ontario—Particulars of a . . 64
Steamer Fulton—Description of the U. S. Mail . . . 339
——— Particulars of an Iron 33
——— Persia—Notice of the Launch of the Cunard . . 66
——— Powhatan—Reply to Remarks in the Nautical Magazine—Performance of the U. S. 266
Steamers, and on Athwartship Bulkheads—On the Manner of Steering 256
——————— Particulars of the

America,	70	Fulton,	36
Antelope,	35	James A. Requa,	333
Adriatic,	391	Jefferson Davis,	411
Canadian,	279	Lewiston,	342
Edinburgh,	332	Persia,	192
Etna,	343	Vanderbilt,	280

Steel by Electricity—On the Manufacture of . . . 248

Stereoscope—Notice of Mascher's Book 323
——————— The Cosmarama, ... 280
Stetson, (T. D.) On Hopkin's Self-Acting and other Couplings for Cars, 85
——————— Notes on the Ignition Gas Engine, . . 388
Stone—Process for making Artificial 132
——————————— Coloring 35
——— Simple Mode of Cutting 66
Stones—Moulding Slag Bricks and Coping 410
Storms and Explosions of Coal Mines—On the Relation between Revolving 207
Sugar Cane and Cotton Bushes—Description of Coates's Machine for Cutting Hemp, Corn, ... 401
Sulphurets on Metallic Silicates at High Temperatures—On the Action of 121
Sulphuric Acid—New Process of Formation of 111
Scythe Fastener—Description of B. F. Joslyn's . . 41
——————————— S. B. Batchelder's . . 42

Telegraph—Description of the Philadelphia Police and Fire Alarm . 416
Telegraphs in Great Britain—On the Railways and . . 217
Texas Western Railway Co.—Extracts from the Report of the . . 73
Time Signals—On the transmission of 54
Trigonometry—Notice of Chauvenet's Treatise on . . 288
Tubes—On the relative proportions of the Top, Bottom, and Middle Web of Iron Girders and 365
Tubular Boiler—On the Evaporative Efficiency of Martin's . . 357
——— Boilers for Western Steamboats, . . . 393

Valve for Steam Boilers—Description of an Oscillating Safety . . 23
——— Motion for Steam Engines—Description of a new Expansive . 361
Vanderbilt—Particulars of the Steamer . . . 280
Vapors from the Chimneys of Manufactories—Discharge of Acid . 194
——— Note on the Latent Heat of . . . 407
——— Tables of the Pressure and Latent Heat of . . 54
Vesuvius—On the late Eruption of . . . 120
Vision of Surfaces of different Colors—On the Binocular . 59
Volute Springs to the Safety Valves of Steam Engines—Application of . 155

Walls—On a new Coating for 116
Watches made by Machinery—Notice of . . . 287
Water by Weir boards—On the Measurement of running . 54
——— Contained in Snow—Experiment on the quantity of . . 195
——— On a Momentum Engine for Steam or . . 207
Western River Boats—Notice of Tubular Boilers for . . 393
Wheels—Description of a Machine for Moulding Cog, or other . 45
Windmill—Description of Halladay's . . . 403
Wines, and other Alcoholic Liquors—On certain Curious Motions observable on the Surface of 57
Wood-bearings to Shaftings, &c., on the Screw Steamer Himalaya—Application of 364
——— Carvings—Notice of Amies' Imitation of . . 72
——— Mouldings—Report on Dale's Machine for working . . 281

Zinc—Statistics of Copper and 69